

1993

Analysis of the effect of networking on computer-assisted collaborative writing in a fifth grade classroom

Gracie Gayle Allen
Iowa State University

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collaborative writing in a fifth-grade classroom**

Allen, Gracie Gayle, Ph.D.

Iowa State University, 1993

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U·M·I

**300 N. Zeeb Rd.
Ann Arbor, MI 48106**

**Analysis of the effect of networking on computer-assisted
collaborative writing in a fifth grade classroom**

by

Gracie Gayle Allen

**A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY**

**Department: Curriculum and Instruction
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Signature was redacted for privacy.

In Charge of Major Work

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For the Major Department

Signature was redacted for privacy.

For the Education Major

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For the Graduate College

**Iowa State University
Ames, Iowa**

1993

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CHAPTER 1. INTRODUCTION

A central theme in Dewey's (1963) writings about education was the belief that classroom activities must be related to the child's interest and personal goals. While the child's goals should be compatible with the teacher's, real learning occurs when the child sees a purpose in the activity and considers it interesting and meaningful. Dewey's theme of child centered learning is finding new supporters with those who believe that the microcomputer can be a learning resource. The significance of the influence of social contexts on students' learning with new technologies is central to understanding the influences of technology in the classroom. The microcomputer can be the foundation to create an environment that will engage children and allow them to pursue tasks that they consider meaningful. As students use computers to learn to write and as computer networks enlarge their learning environment, research is needed to explore the effects of these technological environments on the written communication skills of young writers.

In the book, Mirrors of Minds: Patterns of Experience, (1987), Roy Pea and Karen Sheingold suggest that the computer is too often the starting point when we investigate

the role of technology in the schools. Instead of beginning with the machine, they advise that one should begin with the learner and the education processes that we need to teach. We should attempt to understand how to use technology to create meaningful learning experiences. This shift of focus implies that we need to require that technology be unobtrusive, even transparent (Dede, 1984), as we search for ways that will enhance learning and create an interactive social environment that uses the technology to assist the learner. The integration of a distance network in the classroom, which acts as an extension of the teacher as the primary reader to create a larger audience for students' writings, can create an environment where students can more freely develop their written communication ability.

With these considerations in mind, this study examines the attitudes and writing improvement of young writers who are developing their writing skills in a functional writing environment that is created by writing collaboratively in pairs within a computer networked environment with access to a distance audience. Can a computer distance network create an environment in which children will be motivated to write? Will this motivation affect their written product? This research report presents, analyzes, and compares data from an attitude survey, holistic evaluation of the writing, and a computer analysis which includes the average length

readability level of the written product. This dissertation will also relate these findings to current classroom practices in teaching and to theories regarding acquisition of writing competence.

Written Language Acquisition

Jean Piaget and L.S. Vygotsky are two of the most influential theorists describing language development. Piaget (1970) writes that the acquisition of language depends upon the development of increasingly complex cognitions until a child can develop perspective and interact with others to imagine other points of view. Vygotsky (1962) considers that the most critical interaction occurs first in the social environment and then the understanding of communication is internalized as children interact in more complex ways with advanced peers and adults. Theories of how a written language is learned has led to a change in the theories of how to teach writing.

Current theory concerning the teaching of writing incorporates the process view of writing which considers the steps that are involved to produce a written document rather than emphasis on the final product. This theory views writing as a dynamic and recursive process (Emig, 1971; Flower & Hayes, 1982; Lindermann, 1982; Reynolds & Hart, 1990). This process involves the generation and organization

of ideas as well as goal setting in the planning stage. The writer begins to take into account the purpose of the writing as well as the audience for whom it is intended. The act of translating the ideas from mental activity into acceptable written sentences is the writing stage. Rewriting, which incorporates both revising and editing, is the stage where the writer decides whether or not changes will be made to the written work. Writing process theory suggests that these stages can occur in any order and simultaneously. In actuality, these stages are often difficult to separate and distinguish.

Process writing encourages rethinking, rewriting, and revising the written text; rewriting and revising can be done much more efficiently with the word processor. Using the word processor, the writer can make changes in words, sentences, and large blocks of text with simple commands rather than laboriously retyping the text. The word processor, according to DeGroff, (1990), Diaute (1985), Heebner (1988), and Miller (1984) is a powerful tool for facilitating and implementing a process approach to the teaching of writing.

In addition to the process view of writing, research now suggests that the writer must be aware of and learn to write for a particular audience and discourse community (Bruffee, 1984). From this social interactive perspective,

the teaching of writing should be integrated into a holistic learning environment and the social context of the student (Graves, 1985; Hull & Goodman, 1989; Teal, 1982). An important development in writing skills acquisition is the ability of children to develop this social interactive perspective that allows them to visualize an audience and a reader of their writing (Bereiter & Scardamalia, 1982).

For this study, a computer networked communication system between students in a fifth grade classroom and a distance audience was created to examine the effects of this environment on the writing skills and attitudes of the students. There is theory and research to suggest that this learning environment will affect the student's interest in writing as well as improve their ability to communicate with written language (Riel, 1983; Quinsaat, Levin, Barite, & Newman, 1983).

The acquisition of writing skills as a result of a telecommunication network and word processing environment is examined to measure the effects on the writing ability of fifth graders and their attitudes toward writing, collaboration, and writing with computers.

Learning to write involves many complex and interrelated skills. The ability to physically utilize the writing tool whether it is a pencil or keyboard, the internalization of the concept that written words can

communicate meaning, as well as the ability to decentralize the message to be able to project the reader's understanding, are all necessary for students to develop as writers (Piaget, 1970 ; Moffett, 1968).

The Writing Community

Teachers of writing and theorists widely endorse the use of peer groups in writing instruction (Bruffee, 1990; Elbow, 1973; Freedman, 1977; Gere, 1987; Moffett, 1968). The use of collaborative groups to teach writing is an application of the "social dimension" of writing. Vygotsky (1978) argues that collaboration is at the heart of the teaching-learning process. He stresses that the "social" nature of cognition is of paramount importance. The zone of proximal development is described as the range where learning occurs when a student is given a problem that is within his/her developmental grasp, and the student, as a result of adult or peer interaction, will gradually become more competent at a more advanced level (Freedman, 1987). Elaborating on the theories of Vygotsky, Bruffee articulates the pedagogical benefits of the collaborative process in the teaching of writing:

Besides providing a particular kind of conversation, collaborative learning also provides a particular kind of social context for conversation, a particular kind of community - a community of status equals: peers. Students learn the "skill and partnership" of re-externalized conversation, writing, not only in a community that fosters the kind of conversation college teachers value most, but also in a community that approximates the one most students must eventually write for in everyday life, in business, government, and the professions. (p. 642)

One area in which collaborative learning shows promise of success is in the teaching of writing where the cooperative writing activities are referred to variously as collaborative writing, writing groups, or peer writing groups. The theoretical basis for collaborative writing groups suggests that writing is a cognitive, social, and interactive process that originates and develops from the interactive communication skills that one acquires as a response to a writing community (Bruffee, 1984). Writing, when viewed from the social interactive perspective, is not a solitary, individual acquisition but rather a scaffolding mechanism that depends on the writing community (Bruffee, 1984; Faigley, 1986; Hansen, 1987).

Johnson and Johnson (1985) and Slavin (1986), researchers in the area of cooperative learning, strongly suggest that cooperative learning situations are valuable in increasing academic performance as well as increasing the motivation to achieve and be accepted into the group.

Cooperative learning seems to facilitate and promote the social acceptance, which in turn, should help students create a language or writing community within which they communicate with written and oral language (Johnson, Johnson, & Stanne, 1986).

The introduction of the computer into the writing community has strengthened the argument for collaborative groups. Many researchers (Diaute, 1985; Dickinson, 1986; Hawkins & Sheingold, 1986) report a spontaneous creation of an interactive social environment as students share their writing on the computer screen, seek help, and read their work aloud. Surveys indicate that writers at all levels of competence realize the power of word processing as a writing tool (Bridwell & Ross, 1984, Smith, 1981).

Writing and Computers

Computer word processing has tremendous potential for using the computer as an enhancement tool in the teaching of writing (Daiute, 1985; Becker, 1990). Colette Daiute, author of Writing and Computers, envisions the computer as a way to increase communication skills. She defines the computer as "a communication channel as well as a writing tool. The computer is a language machine" (p.7). This language and communication machine can be used to process information with less physical ability, facilitate management of ideas

and facts, as well as allow students to communicate over any distance. In a national survey of U.S. schools, H. J. Becker (1990) concludes that the instructional use of the personal computer for writing signaled the beginning of a new era in composition teaching.

The use of the computer as a writing enhancement tool and as a possible way to contribute to children's mastery of language is envisioned by theorist Seymour Papert in his book Mindstorms (1980). Papert says: "I believe that the computer as a writing instrument offers children an opportunity to become more like adults, indeed like advanced professionals, in their relationship to their intellectual products and to themselves" (p.31).

Computers in the elementary classroom serve as tools which enable the young student to write with more ease than using a pencil and paper and to experience writing in a different environment. The lack of physical writing skills, as well as the inability to communicate ideas to an audience, usually hampers the young writer.

The computer word processor is becoming the writing tool of choice in classrooms (Becker, 1990). The computer word processor requires less physical control than writing with pen or pencil, the use of the computer seems to result in increased fluency where the student is writing longer text. The quick and efficient modifications that

can be made on the written product also permit students to correct, change, and revise their writing and encourage peer editing (Diaute, 1986a; Hawisher, 1987).

Computer-Mediated Communication

The discussion thus far has concerned itself with groups that physically share the same space and time. Computer-mediated communication extends the limits of time and space by allowing participants to interact with each other via the computer and an established distance network. This communication, when used as a link between children, teachers, and the outside world, can be a powerful education environment (Levin, Riel, & Cohen, 1987; LGHC, 1987; Newman, 1987; Riel, 1986). A classroom which combines writing groups, computer word processing, together with a distance network, can create a functional learning environment as described by Newman (1986). This functional learning environment where writing is the pedagogy goal, may allow the elementary students to strengthen their written communication skills. This environment uses computer-mediated communications, where participants can write and send messages to designated readers or post messages on public space or bulletin boards which everyone with access can read. Responses to these written messages can be

immediate in "real-time" or there can be a delay of considerable time.

The question of how written communication carried out over distance and with different readers who are not within the same classroom will affect the writing and attitudes of the students is the focus of researchers conducting studies in computer-mediated communication. The computer based distance network supports collaboration in the classroom and is an extension of the learning environment that cannot be achieved without the technology (Dede, 1989). The computer and a modem utilize the telephone lines to link students to distant classrooms where they can experience a different culture and learn to communicate with students who may have a different perspective. The students work together in the classroom and on-line to share information and knowledge (Levin, Riel, & Cohen, 1987; Newman, 1989; Reil, 1985).

The idea of a language community is the basis for the importance of "audience" in the teaching of writing. Instead of writing for the teacher, current audience theory suggests that students can better visualize the intended audience of their writing if they have peer interaction and communication. The collaboration with peers creates a new awareness of who reads the final written product and what must be done to communicate the intended message (Reither, 1987; Lindermann, 1985).

The use of a computer-mediated communication system such as a distance network, extends the limits of time and space by allowing users to interact with each other using the computer terminal and a modem (Harasim, 1990). Computer-mediated communication may be in the form of electronic bulletin boards, electronic mail, or conferencing systems. The electronic bulletin board provides a public space for groups or individuals to post messages and receive answers. Electronic mail enables individuals to send and receive messages that are directed to an individual address. With some systems these messages can be exchanged simultaneously, or in "real-time." Conferencing systems utilize the bulletin board and the electronic mail system. The exchange of messages can be posted or can occur in real-time. The conferencing system is more structured but still provides a common "writing space" for the written communication to occur. This study will use both the bulletin board and the electronic mail to facilitate written communication between fifth grade students and online readers.

Statement of the Problem

The research literature is now suggesting that writing is a social process as well as a cognitive process. The integration of the distance network as an extension of the

collaborative peer group and use of the word processor as a writing tool can create a functional writing environment where students can improve their written communication skills. As more classrooms are equipped with computers, modems, and distance networks, there is a need for research in this type of learning environment to determine the effectiveness of the interactive capabilities to expand the perspective of the student and to provide motivation that will encourage better written communication. The literature has further shown that the assignment of children to groups for collaborative work should be a major consideration for the writing teacher. Educators are beginning to realize the potential of computer based cooperative writing environments in their classrooms. A study is needed which investigates the use of a networked collaborative writing environment to determine if there is an effect on students' attitudes toward writing and collaboration as well as the quality of their written product.

Statement of the Purpose

The purpose of this study was to collect data regarding students' written products as they wrote in a computer-mediated learning environment and a regular classroom. All students used the computer for writing and each wrote with a partner of the same gender. The effect of the computer

mediated environment and gender pairing was determined by holistic graders and readability statistics. The students' attitude toward computers, writing, and collaborative group work was measured before and after the study. The results of this exploratory study should provide a basis of information about writing partners in a collaborative computer learning environment and knowledge about the effect of the networked environment on students' writing as well as the change in attitude toward writing, writing with computers, and writing with partners.

Research Questions

The integration of a distance network as an extension of the collaborative peer group and a writing audience promises to create an environment where students will collaborate and improve their written communication skills. The research questions addressed in this study are asked in order to acquire additional information on how students will utilize this technology, and if the networked environment will effect the writing that they do. The research questions examined in this study are:

1. Will there be a difference in the writing produced as measured by holistic scoring and readability analysis when a student is assigned to the experimental computer-mediated writing environment or the control group?

2. Will there be a difference in quality of writing produced when students are paired as male or as female writing partners?

3. Will there be a difference in male students and female students' attitudes toward writing, collaboration, and writing with computers?

4. Will there be a difference in students' attitudes toward writing, collaboration, and writing with computers when a student is assigned to the experimental computer-mediated communications writing environment or the control group?

Limitations of the Study

This study was conducted in view of the following limitations:

- 1) It was necessary for the students and teachers to be familiar with computers, word processing, and cooperative learning, thus generalizations to other populations are restricted.
- 2) The need for students to have access to a technology rich environment which includes a distance network work will limit the generalizations of the study.
- 3) The teachers involved in the study were using computers and word processing in the regular classroom and had facility with equipment needed for distance networks.

Definition of Terms

Audience - the intended reader of the written communication.

Collaborative writing - co-authorship and group authorship where two or more people are directly involved in drafting, revising, and producing a piece of writing (Ede & Lunsford, 1984).

Computer-Mediated Communication - three forms of communications: conferencing systems, electronic bulletin boards, and electronic mail.

Cooperative learning - a learning situation where students' have common goals for learning the material. When a student achieves his or her goal, all others with whom he or she is cooperatively linked achieve their goals (Johnson & Johnson, 1975).

Distance Computer Network - telecommunications that link up computers using modems and telephone lines.

Flesh-Kincaid Grade Level - is a readability statistic that measures how effectively a piece of writing communicates. The formula for the Flesh-Kincaid Grade Level statistic is: $(0.39) \times (\text{average number of words per sentence}) + (11.8) \times (\text{average number of syllables per word})$ giving a total which is the grade level. A readability score of between 6th and 10th grade is considered most effective for a general audience.

Functional Learning Environment - a learning environment where learning activities have a function or purpose from the point of view of the child (Newman, 1987).

Gunning's Fog Index - a readability statistic that measures how effectively a piece of writing communicates. The formula for the Gunning's Fog Index takes the average number of words per sentence plus the number of words of 3 syllables or more times 0.4. The Fog index is a measure of the approximate grade level a reader must have achieved to understand the document.

Holistic Scoring - evaluation that is a guided procedure for sorting or ranking written pieces. This ranking assigns a score to the whole piece from an overall impression of the writing.

Modem - a computer interface which allows one computer to communicate with another over telephone lines.

CHAPTER 2. REVIEW OF THE LITERATURE

Introduction

The purpose of this research study was to investigate the effects of a computer linked distance network on the writing of elementary students. The review begins with a discussion of two theoretical perspectives of writing acquisitions skills: the first from the cognitive approach and the second from the social-interactive approach. This is followed by a discussion of the writing community as it encompasses cooperative learning and collaborative writing in the classroom. Next, the application of computer word processing to the teaching of writing is examined with an emphasis on how computers affect the quality of writing. Telecommunications in the classroom is the final topic of review. This section will examine how the computer linked distance network can function as an extension of the writing community to create a functional writing environment. The research review will provide insights into how technology rich environments can be a resource for capturing children's interest and nurturing a community of writers.

Written Language Acquisition

The acquisition of writing skills has often been the topic in current composition and rhetoric research. It is the potential for understanding how writing skills are acquired that seems to be the guiding factor for the continuing search for an understanding of how we learn to write and how we can create classroom environments that will be conducive to helping young students become better writers.

In the last two decades there have been many new ideas and insights from the fields of cognitive and social science that have influenced the teaching of composition (Hairston, 1989). Earlier emphasis on the final written product is shifting to a gradual acceptance of a process theory of composition. Researchers have begun to document that writing is a complicated and recursive process (Emig, 1971; Flower & Hayes, 1972) and to study writing as a process of development and of social interaction. Jean Piaget and L.S. Vygotsky are two of the most influential theorists describing language development. Although their theories are distinct in important ways, they can be viewed as being complementary in explaining what happens when children acquire written language.

Piaget (1959) argues that the acquisition of language depends upon the development of increasingly complex

cognition, that is essential to the process of "decentering." This is a process by which a child develops from a state of "egocentrism," or self-centered perception of the world, to a perspective that acknowledges the perspective of others. According to Piaget, the ability to distinguish oneself from others enables the child to socialize and interact with others and to imagine other points of view. The facility to be able to assume these alternative views is essential to communication with written symbols.

Piaget (1959) contends that the child "builds up" knowledge through interaction with the world. Through a process of assimilating new experiences into current schema, the child constructs and reinvents his or her own organization of knowledge. This theory of development views learning as dynamic and interactive in character, but also an isolated and individualistic act (Teale, 1982). According to Flavell (1963), Piaget finds that the young child "frees himself from the grip of egocentrism" as a result of direct social interaction with peers. Flavell, in discussing Piaget (1963, p.179), states:

In the course of his contacts (and especially, his conflicts and arguments) with other children, the child increasingly finds himself forced to reexamine his own percepts in light of those of others, and by so doing, gradually rids himself of cognitive egocentrism.

For Vygotsky (1978) language development is also interactionist, but the interaction is not between the learner and the object of knowledge but between the learner and another person (Farr, 1985). The development occurs first in social interaction and then in individual cognition. In Vygotsky's view, social interactions that use language are essential for the development of writing skills. Vygotsky (1978) writes: "Egocentric speech emerges when the child transfers social, collaborative forms of behavior to the sphere of inner-personal functions" (p.20). The understanding and ability to communicate using language begins with this cultural interaction. Children observe their learning community and interact with the members in increasingly complex ways as they receive feedback from more advanced peers and adults.

Piaget's theory focuses on the isolated, individual nature of language development while Vygotsky's emphasizes that there must be verbal, social interaction for language development. These two theorists provide the basic foundation for discussion of the cognitive processes in social situations and social interaction to account for writing acquisition. Both theories support the importance of interaction where learning is a constructive process in which students create their own understanding. This type of social interactive environment can be nurtured in a

collaborative computer-mediated writing environment where writing is done in an authentic context.

Writing as a cognitive process

The psychological foundation of language acquisition discussed above has influenced the theory of writing acquisition as a cognitive process. The explanation of writing as a cognitive process describes writing as a series of recursive steps that the writer can learn.

Researchers have found that writing involves not just one process but several recursive steps, and that these processes are difficult to reconstruct. The work of James Britton (1975), Janet Emig (1983), John Hayes and Linda Flower (1980), and Donald Murray (1985) employed different methods of describing the writing process, but they substantially agree that the process is a nonlinear, recursive cycle. The process theory of writing was proposed by researchers like Emig, Britton, Hayes, Flower, and others who described the writing process from observation, interviewing, and analysis of written products to document the cognitive processes that a person uses to produce a written text.

This writing process can be defined as a developing and recursive process (Fleury, 1988; Emig, 1971; Flower & Hayes, 1972; Reynolds & Hart, 1990) that is composed of

multiple stages (Bereiter & Scardamalia, 1982; Calkins, 1986; Heald-Taylor, 1989; Wheeler, 1985). These stages can be depicted as a nonlinear, multistage, procedure delineated as planning, composing, discussing, revising, and editing steps that can occur at any point in the writing (Britton, 1978; Emig, 1971, Lindermann, 1982). For example, the writer engaged in prewriting or planning might generate ideas, revise recent plans, and draft an outline of the final structure in a cyclic manner. The underlying thinking that occurs at all parts of these stages is the "writing process" (Sowers, 1985).

Flower and Hayes (1972) and Bereiter and Scardamalia (1982) used protocol analysis in laboratory settings to document the cognitive writing process model. They defined the writing process as planning, translating, and reviewing and described an internal "monitor" that must be developed to operate throughout the composing process. The writing model that Flower and Hayes (1972) describe includes the task environment (or what text one wants to write or has written so far), the writer's long term memory, and the writing process that one breaks down into planning, translating, and reviewing. Writing is seen as planning the information that is received from the internal monitor that comes closer and closer to the goal representation through an ongoing process. This process is under constant

generation of approximation and assessment of the outcome while the internal monitor allows experienced writers to review their texts at both the surface and global level to see how it conforms to their intended purpose (Hayes & Flower 1980; Sommers, 1980) This review process must be adjusted for each new experience that requires writing for a new community (Sommers, 1980).

Being able to use the strategy involved in planning what to write, not simply writing whatever comes to mind, seems to emerge fairly late in childhood (Bereiter & Scardamalia, 1982). Researchers Bereiter and Scardamalia asked children of various ages to produce a written plan for a paper they were going to write. They found that children under the age of fourteen produced a rough draft of the paper. Older students, when asked, produced plans that were distinct from the text itself. Other studies have found that even high school and college students devote little time to planning before they begin to write (Humes, 1983). When and where the internal 'monitor' begins to develop and become part of the writing experience is still open to question. The initial success of a writer depends largely upon the ability to retrieve useful information from long term memory and to reorganize or adapt that information to fit the demands of the writing assignment (Hayes & Flower, 1980; Hayes & Flower, 1986).

It is through the strategies of planning and translating which the writing process describes, that writers seek to discover meaning and utilize the internal monitor to determine if what they have written has communicated meaning (Hayes & Flower 1986). In the process of developing their thoughts and ideas and creating unique responses, the writers write as a means of communication, first with the internal monitor and then with an audience. The ability to ascertain if communication has occurred is a skill that requires an appreciation of an audience (Ede & Lunsford, 1984). Piaget (1959) refers to this ability to envision an audience outside one's self and to reconcile other points of view with one's own as decentering. Looking at one's writing from the perspective of others requires an objective, uninvolved viewpoint, which is difficult even for older students. Bereiter and Scardamalia (1980) write that egocentric writing results from an incapacity to take account of the reader and deal the other demands of writing at the same time. Therefore, it is important that young writers have structured groups that provide interactive feedback during the writing (Balajthy, 1986). Students who receive feedback and assistance during the writing process seem to make more appropriate modifications of their writing (Gebhart, 1980; Reynolds & Hart, 1990).

Writing as a social process

In addition to the cognitive view of writing acquisition, the research also shows there is a theoretical basis for defining writing as a communication skill that is acquired as the result of a social interaction. This theory of writing as communication is supported by many theorists including Vygotsky (1978), Bruffee (1973), and Faigley (1985). Written language communication, according to the social theorists, occurs in a language community that views the acquisition of language ability from a combination of reading, listening, speaking, and writing all taught within an environment that has meaningful context and is "whole."

Young writers are learning to write as a result of a cognitive process which is activated by a communication and social process. The holistic approach to writing acquisition refers to the use of authentic learning situations in which language is learned in a cultural context (Searfoss, 1989), fulfills a purpose (Edelsky, Draper, & Smith, 1983), where communication of meaning is the reciprocal focus of the activity (McWhirter, 1990). Advocates of holistic language maintain that children learn to write by operating within a literacy framework where they begin to view themselves as writers (Smith, 1971) and communicators (Daiute, 1986). Whole language instruction emphasizes that writing is a way to convey an idea and that

the ideas are found as a result of a literary environment that encourages listening, speaking, reading, and writing. Calkins (1986) suggests that writing teachers need to create opportunities for young writers to read their work and discuss it with peers. Farr (1985) describes current writing theory as language that extends the theories of sociolinguists such as Labov and Hymes who view language variation as patterned and predictable. These variations are seen in different groups and situations.

Through the language that is developed and shaped by the language community, communication within this community becomes essential to aiding the development of the writer's own ability to monitor and adapt his or her own written communication. Bruffee (1984) sees this as a process of collaboration where the writer expresses through language and social integration those internal thoughts that were generated as a result of the learning environment. According to Bruffee, the social group provides a means for students, through the expression of their thoughts and ideas in a collaborative environment, to formulate their ideas and then to "re-externalize" them through writing.

The discussion thus far provides a theoretical justification for the use of a collaborative functional learning environment in the classroom. The social context in which language is used is crucial to the development of

written language. In the following section, social context in a writing community will be examined for its influence on children's writing acquisition.

The Writing Community

The concept of a classroom as a community has provided a basis for teaching writing in small groups (Bruffee, 1973; Elbow, 1973; Gere, 1987; Moffett, 1968). Writing classrooms use peer writing groups to create positive, supportive groups who share their writing with one another. The concept of writing groups form the basis for the classroom writing community.

In recent years, researchers and teachers have joined in a movement to understand how more collaborative activity or community can be infused into the language arts writing curriculum. Collaborative activity provides a sound basis for the production of written texts as we will delineate in the following section. From the seminal work of Vygotsky, educational theorists argue that since language develops from interactive, collaborative situations (Britton, 1975; Bruffee, 1984; Moffett, 1968) classrooms should be structured to facilitate collaborative activity when teaching writing. The following sections of the literature review will look at collaborative learning in general and

specially how the research applies to collaborative writing groups.

Cooperative learning groups

Cooperative learning can be defined as a planned learning environment. Within this environment individuals learn to work in small groups to accomplish a specific task so that the goals of each individual are linked together in a manner that facilitates a positive correlation between their individual goal and the goal of the group (Slavin, 1991).

In the 1981 meta-analysis, Johnson, Maruyama, Johnson, Nelson, and Skon analyzed 122 studies of cooperative, competitive, and individualistic goal structures on achievement. The conclusion from these studies indicated that cooperative learning experiences resulted in higher achievement and greater retention of learning than did competitive or individualistic learning. These studies included students of various ages, ability levels, subject areas, and ethnic origins. Cooperative learning experiences have also resulted in more positive attitudes toward the subject area than have competitive and individualistic learning experiences (Johnson & Johnson, 1976).

The planned structure of classroom groups can create an interactive climate that encourages students to become

actively involved and socially responsible participants in their own learning (Johnson & Johnson, 1975; Slavin, 1978; Sharan & Shacker, 1988). These structured learning situations affect student achievement as well as their attitudes towards learning. Johnson, et al. (1985) found that girls in cooperative learning conditions tended to stay with the assigned task longer and were more persistent in trying to achieve than boys, and the opposite was true for the competitive condition.

Not all cooperative learning is alike. Slavin's (1983a, 1983b) cooperative learning methods stress the importance of group goals and individual accountability which can use inter-group competition and extrinsic rewards for group achievement. Johnson and Johnson (1977) stress cooperation without intergroup competition. Researchers investigating cooperative learning from a feminist perspective caution that without clear guidelines the cooperative structure can replicate existing patterns of dominance which may be problematic for girls and less assertive individuals within the group (Sapon-Shevin, 1991).

Research on cooperative learning has traditionally examined the academic as well the social-interactive effects on students (Johnson et.al, 1981; Sharan & Shacker, 1988; Slavin, 1983). In a study that examined language arts and attitude, Johnson, Johnson, and Anderson (1976) concluded

that cooperative, rather than individualized class learning resulted in significantly more positive attitudes toward classroom life. Also reported was higher achievement in language arts where the cooperative groups made significantly fewer errors on daily assignments, were more fluent, and had fewer grammatical errors than did subjects in the individualized group.

Sharan and Shacker (1988) found that students taught in cooperative learning groups achieved average gains nearly two and a half times those taught by the whole-class method. These findings are especially significant when one realizes that the students involved spoke widely different language dialects. The data strongly suggest that the students who were the "lower-class" dialect "contributed a great deal to the group's discussions, and that their contributions were accepted by all of their peers. There was no evidence of their being passive, intimidated or tolerated. Instead, they were full collaborators, active and involved in the group process." p. 150 (Sharan & Shacker, 1988).

Collaborative writing groups

The interactive social context of collaborative writing groups finds support in research in the broader field of cooperative learning but also has a research history particular to the writer as a member of a particular

community. Kenneth Bruffee (1984) suggested that writing is not a skill that is learned or produced in a vacuum but is a product that emerges from the ideas and expectation of a particular community. This community can be a classroom, a business, or a group of related learners who come together to create their defined community. This community, according to Bruffee, determines the correctness of the final product from a consensus of the group.

This concept of community has been the basis for teaching writing in defined groups (Bruffee, 1973; Elbow, 1973; Moffett, 1968). The peer writing group is now commonly used in the writing classroom to create positive, supportive groups where the members share their writing with each other. This peer response produces a sense of audience and helps the writer perceive different view points and understand different perspectives (Britton, 1978; Gebhart, 1980; Gere, 1982; Murray, 1980).

In addition to developing a sense of audience, peer writing groups have also increased students' interest in writing. Using data from the Fourth National Assessment of Educational Progress in Writing, Soltis and Walberg (1989) found that adolescents who shared their writing in a supportive peer group were significantly more interested in writing and achieved higher scores on writing samples than those who did not have such a peer group.

The current philosophy which views writing as a process that is best learned in a supportive social-interactive community, recommends that a literacy environment be structured within the classroom which serves as a functional writing environment. The shift has occurred from viewing writing as a final product that can be modeled by the teacher and imitated by the student to the view that writing is a dynamic process of discovering and communicating ideas. This shift creates new learning contexts for teaching writing (Sommers, 1980; Hariston, 1985). The teaching of writing as a process seems to promote peer interaction and feedback, which in turn, helps writers define their audience (Ede & Lunsford, 1984).

Word Processing and Writing

In the last fifteen years, research has increased our knowledge and expectations of what writing should mean for elementary students and how computers can be utilized to achieve these goals. Learning to write in elementary school is no longer a mechanical process of learning to form letters with a thick, black pencil to create a flawless text but is understood to be complex activity that is dependent on intricate social context (Cochran-Smith, 1991; Farr, 1985). This shift in thinking about what writing in elementary school consists of has changed the instruction.

According to Cochran-Smith (1991) beginning writers are "invited to invent their own spelling, compose their own stories, and read their own texts" (p. 107). As these young writers work with their texts they are encouraged to progress through a number of drafts getting feedback not only from the teacher but from their peers as well.

Word processing is a computer software that was originally developed and utilized by professional writers with rapid dissemination to student writers, including very young children who can utilize the unique feature of this technology (Bridwell, Sire & Brooks, 1985; Cochran-Smith, Kahn, & Paris 1991). Word processing does facilitate text revision, if for no other reason than the ease with which changes can be made without the drudgery of retyping or handwriting for a fresh paper copy (Daiute, 1986a; Harris, 1985; Hawisher, 1989). Students tend to produce longer documents after writing instruction on the word processor (Cochran-Smith, 1991; Hawisher, 1989); this can be taken as evidence of an increased willingness to engage in the writing task.

Making changes and rewriting using the word processor is efficient and effortless making it an ideal writing tool. The ease and efficiency of changing texts is one of the major reasons for the adoption of computers in the classroom (Becker, 1990). Increasingly the word processor is

available in the elementary classroom (OTA, 1988). With more computers accessible, computers can become an enhancement tool to assist in creating a learning environment where students interact with each other and the computer. This interaction may, in turn, help to create a writing community where social interaction and the writing process are complemented (Riel, 1985; Diaute, 1986; Cochran-Smith, Kahn & Paris, 1991).

This section of the literature review will examine the impact of the word processor on the composing process of students as well as on the social process that views writing as a written communication. Emphasis in the composing process will be on the studies that examine the revision stage of the process by looking at how the number and type of revisions affects the quality of the written product. Examination of the social process will focus on the effect the computer has on writing within the classroom environment.

Word processors and composing processes

A considerable body of research exists that examines the impact of word processing on how students move through the writing process. The parallel developments in the adoption of the writing process as a theory of teaching writing and the use of the computer in the classroom have

both occurred in the last decade. Most of the research in this area focuses on the number and kinds of revisions writers make when they have access to word processors. The underlying assumption is that an increase in attention to the developing text will result in rewriting and revision which will lead to an increase in overall quality. However, much of the research would suggest that an increase in revisions does not have the desired effect on quality without the necessary and appropriate instructional intervention.

Rodrigues and Rodrigues (1984), Cochran-Smith, Kahn, & Paris (1991), and Daiute (1985) see the word processor as a tool that can be used to teach the writing process in composition instruction. The word processor's ability to facilitate the rewriting, revision, and editing in the writing process makes it an ideal writing tool (Bean, 1983; Daiute, 1986a; Harris, 1985; Schwartz, 1985; Wresch, 1984). Easy manipulation of the text by keyboard or mouse commands allows uncomplicated change of text order, spelling correction, and rewriting of multiple drafts (Balajthy, McKevey, & Lacitigrola, 1986-87; Dauite, 1985). This ease of correction and change of text at the word, sentence, and page level makes the word processor ideal for teaching the writing process especially integral parts of the rewriting and revision.

Number of revisions

There are mixed results in the research that investigated the effects of word processing on the number of revisions made. Revision of text can be classified as surface changes that do not affect the meaning of the text or global changes which do affect the meaning (Faigley, 1986).

Several studies have examined differences in the ways writers approach revision when using a word processor. There are mixed results in the research that has explored the effects of word processing on the number of revisions made. Some studies indicate significant increases in the number of revisions made (Collier, 1983), others find little or no difference (Hawisher, 1987). One of the reasons for this discrepancy may be types of revisions that are counted as well as the point where they are counted in the writing process. If a student has been making changes throughout the writing, there may be fewer major changes to make at the final draft.

Most of the studies examining the number of revisions have been with high school and college age writers, however there are a few that examine the writing of elementary age students. For example, teachers reported that using word processing encouraged fourth graders to revise (Boudrot,

1984) and that second and third graders edited their writing more thoughtfully when they used word processing (Borgh & Dickinson, 1986). Phoenix and Huyghenian (1984) found that first graders were more aware of ways to manipulate text and even when they wrote without the computer, they continued to insert, delete, rewrite, and change spelling. They seemed to have integrated the revision cycle of the writing process into their writing.

Recent work by Daiute (1986b) indicated significant positive results in the effects of word processors on revisions and on editing and also found that children increased their revision with pen and paper after using the computer for writing.

Kind of revisions

Many researchers think writers use word processing to revise in the ways they already know, and better writers revise more effectively. Kane (1983) concluded that junior high students tended to use the word processing to write the way they had already established and did very little recursive writing. Wolf (1985) found that both eleven-to-twelve and thirteen-to-fifteen-year-old writers did word and sentence revision, but that only the older group revised and moved large blocks of the text.

It is generally accepted that more experienced writers are more competent because they have more effective revising skills (Sommers, 1988). This conclusion seems to hold for even young writers and finds support from Evans (1986) and Flinn (1985) who studied fifth and sixth grade classes. Evans compared the uses of word processors in classes where students were familiar with process writing and those that taught in the traditional skills writing class. She found that the students who had been taught to edit as part of the writing process did more editing than the students who were part of the skills class.

Similarly, Flinn (1985) compared sixth graders who were experienced with word processing and those who were not and found that the children who had the word processing skills received higher scores on writing samples. Both groups tended to revise the type of problems they had been taught to correct. Word processing has the unique potential to support the revision of text and meet the goal of teaching writing with a process emphasis (Calkins, 1986; Graves, 1983) where language is used to learn not just demonstrate what is already known (Burke, 1984). Elementary students have difficulty concentrating on what they are writing because so much of their cognitive energy is focused on how they are spelling, forming letters, and making corrections. Therefore, it has been proposed that word processing may be

a very effective use of the microcomputer for elementary school instruction (Daiute, 1985a; Edelsky, 1984; Green, 1984) since it may allow the writer to concentrate on meaning rather than production.

Research literature indicates that there is a relationship between already established writing and revising skills and the student's ability to transfer the writing skills to utilize the capacities of word processing. When examining the case for word processing for elementary school writers, one needs to note that nearly all students at this age are in the process of developing their writing abilities and that without instructional intervention, word processing alone cannot be expected to prompt new strategies (Cochran-Smith, 1991).

Three reviews of the literature (Balajthy, McKeveny & Lacitigrola, 1986; Hooper, 1987; Cochran-Smith, 1991) reached the conclusion that word processors do ease the revision process for students. Daiute (1985a) described how the word processor minimizes the physical and mechanical difficulties for young writers. Later research by Daiute (1986) that measured the effects of word processors on revisions indicated that students' compositions improved in length and quality. Hawisher's (1987) study of revision and word processing found that the number of final revisions did not correlate with the quality of the finished product, but

reached the conclusion that the ease of editing allowed immediate revision and therefore, the quality was less influenced by the final revision.

Effect on final product

Teachers who use the word processor in their writing curriculum might expect that the ease of revision would result in more attention to rewriting and revision and produce better written material. However, the research data are inconsistent on word processing leading to improved writing. Cochran-Smith (1991) suggests that writing quality is difficult to quantify with many variables to be considered, especially the age and development of the student.

In studies that used holistic quality as a measure of improved writing, there are mixed results. Hawisher (1987), Coulter (1986), and Cross and Curey (1984) found the overall quality rating for essays produced with word processing were similar to those for texts written with pen. Willinsky (1990) did not find higher class grades for students who used a word processor for their assignments than for those who wrote by hand or typed. McAllister and Louth (1988), on the other hand, found significantly improved paragraph writing among college writers. Vockell and Schwartz's (1988) findings also indicated that students using a word

processor had a consistent pattern of doing better on writing tests than the control group. Bernhardt, Edwards, and Wojahn (1989) found that the quality of writing done with word processors improved when compared with writing using traditional tools.

These discrepancies between Hawisher and McAllister and Louth and Vockett and Schwartz may be explained by the fact that in the latter studies the students received minimal instruction in writing whereas in Hawisher's study all students received instruction in writing and word processing throughout the semester. When quality of writing is being assessed in a study, care must be taken to record the kinds of writing instruction that the students receive when doing the word processing (Cochran-Smith, 1991). Instruction and social context are still critical factors that must be considered when explaining the change in the quality of written products.

Word processors and social processes

With the convergence of the process approach to teaching writing and the word processing capabilities of the microcomputer, the synergy is present to create a new learning environment that can be more than either process approach or the tool alone (Shiengold, 1989). A new research direction is emerging that looks at the way the computer is

implemented in the individual classrooms. After a 5-year study that investigated how the technology affected the learning in classrooms, Hawkins and Sheingold (Hawkins & Sheingold, 1986; Sheingold, Hawkins, & Char, 1984) concluded that the computer itself was not a treatment in the classroom. They saw it as a technological device with the potential for various uses depending on the classroom teacher.

Computers are becoming more and more popular as learning tools in schools. A national survey conducted by Becker (1990) reported a consistent annual increase of computers in schools, an increase on the order of 350,000 new computers per year over the last six years. How these computers will be used in the classroom and whether they will play a significant part in creating a learning environment where students interact to create a writing community is now being asked (Newman, 1987; Shiengold, 1989).

The increase in the number of computers in schools may increase the basic literacy as a result of children's involvement with microprocessor in their classrooms. However, there is evidence to suggest that without conscious intervention female students have less involvement than male students with computers in schools, irrespective of class or ethnicity (Center for Social Organization of Schools, 1983-

84; LCHC, 1987). Both the context and the manner in which computers are introduced into the education process tend to be discouraging to the participation of girls. When computers are introduced in the context of computer-programming courses, boys demonstrate a higher level of interest and achievement (Hawkins, 1985; Hawkins, Shiengold, Gearhart, & Berger, 1982; Pea, Hawkins, Clement, & Mawby, 1984). In contrast, when computers are introduced as tools for writing in a collaborative and cooperative context, girls and boys are usually equally involved (Kurland & Pea, 1983; Whooley, 1986). When the software and the learning context are designed to be sensitive to the concerns and reactions of girls as well as boys, girls readily become involved with computers (Hawkins, 1985; Hawkins & Sheingold, 1986; Linn, 1985).

Whether the computer will be used to create a competitive, individualistic, or cooperative environment will be the choice of the educators. Early studies indicate that the cooperative environment can result in more learning and in more positive attitudes among students. Johnson et al. (1986) examined the impact of cooperative, competitive, and individualistic learning situations on eighth grade students' achievement and attitudes as they worked on a computer simulation task. Findings indicated that the

cooperative group had more positive attitudes towards computers and scored higher on text material.

One of the questions posed by the literature discussed above is how the use of word processing and teachers' intervention instructionally can enable student writers to use the capacities of word processing effectively. The importance of external motivation for improved utilization of the word processing has been reported by several studies. Studies by Schwartz (1985) and Soltis and Walberg (1989) suggested that students will make structural changes only when they are motivated by a teacher or by peer suggestions. The Soltis and Walberg survey found that the peer writing groups' influence was the strongest motivator for change.

The majority of computers in elementary schools are widely dispersed throughout the school. Only about 25% of all elementary schools have 15 or more computers in any one room. Even with a significant increase in the number of computers in elementary schools from six per school in 1985 to twenty in 1990, only a small percentage of students in any one school can simultaneously use the computers (Becker, 1990).

This scarcity of computers in the schools has forced teachers to group students around the computer for class work. As a result of the grouping of students at the computer, interesting results have become apparent regarding

small group interaction (Daiute, 1985; Riel, 1984).

Research in the area of small-group, computer based interactive learning situations shows there is a possibility the computer facilitates the creation of a functional learning environment that can lead to enhanced student achievement in writing.

This collaborative, small group environment seems to flourish in classrooms that contain one or many computers. Researchers concerned with the social environment created by the introduction of technology in the classroom (Riel, 1983; Diaute & Dalton, 1986; Hawkins, Sheingold, Gearhart & Berger, 1982) maintain that the computer facilitates cooperative work between children. Studies by Hawkins, Sheingold, Gearhart, & Berger and Diaute & Dalton concluded that children working around the computer collaborated with each other more than when they were not working around the computer.

A modest amount of research has examined the potential value of collaborative student writing using word processors (Allen, 1988; Daiute, 1986, 1987; Dickinson, 1986, Heap, 1987; Herrmann, 1987). These studies defined collaboration as two or more children writing together to create one text.

In an ethnographic study, Dickinson (1986), studied twenty-one children in a combined first-second grade class.

Collaboration among the children seemed to materialize in the writing period when the children wrote on the computer. This interaction stimulated articulation about the writing that was being attempted and gave the children a source of peer feedback to help evaluate the effect of their writing.

A case study was used by Daiute (1986a) to look at the effect of the computer on two young writers who wrote together over a period of eight months. The study's result indicated that both students improved in the length and complexity of their written work. Daiute concluded that collaborative writing activities around the computer are promising but that additional research is required to determine if there is transfer of learning to autonomous writing processes.

Heap (1987) argued that there is a difference between collaborative and individual computer writing after he used a case study method to record the activities of four groups of children. He concluded that the various socially organized ways that children have of using computers need to be studied before we decide how computers should be used in the writing process.

A year long study by Herrmann (1987) of a high school English class indicated that collaboration in writing was slow in developing among students. However, the students who made noticeable gains in writing ability were the ones

who were highly positive about collaboration and had become part of a peer response group which shared writing and editing of their text.

In a 1986 study, Allen investigated the effect of working cooperatively at the computer on student writing. She concluded that students not only improved their written product when working collaboratively at the computer but seemed more confident and successful when writing individually. Cooperative computer work also improved students' attitudes toward writing as well as toward themselves.

One of the interpretations suggested by the literature review thus far is that the computer can act as a tool for the teaching of writing to young writers and can create a collaborative learning environment where writing is shared. An extension of this interpretation of the use of the computer is to create a functional writing environment in the classroom with the use of computer-mediated communications to connect with distance audiences. Papert (1980) called the computer a Protean tool meaning that it can be used in a variety of ways changing to accommodate the needs and interpretation of the people using it. The next section of the literature review will discuss a functional writing environment and how it may affect how students communicate using written language.

Functional Writing Environments

Functional writing environments can be considered a subset of the functional learning environment described by Riel (1985) and Newman (1987). They define a functional learning environment as one that assumes that classroom tasks should be meaningful to children and by showing them the use of the skills involved to complete the task they will be learning in a meaningful context where the relationships among the tool, the task, and the future use of the skill is realized by the student (Riel, 1985; Newman, 1987). The theoretical motivation for this research comes from both the cognitive and social theory of writing acquisition as well as the historical heritage of how writing is taught in groups.

Both the cognitive and social acquisition theories emphasize the importance of social interaction for development of writing skills. This social interaction can occur, as Vygotsky describes, when a teacher or a more experienced child becomes a guide that gives the student a cultural interpretation and significance of the tasks in which they are engaged. Dewey wrote about child centered schools that give students authentic assignments of meaningful work. This philosophy is basic to the writing community that can be created using technology to form a

technology-mediated interactive writing environment (Dede, 1989). Expanding social interaction beyond the immediate classroom by using a computer network to create an expanded audience and to experience a different culture should break down walls for students and give them reason to use written communication (Shiengold, 1989). The functional writing environment should not only encourage children to write, but also provide a context that increases their awareness of audience of their own work. One of the questions that is a concern in this research study is how the social context will affect the written communication of students who are exposed to this environment.

The following section will examine the research that supports the proposition that collaborative learning, the computer, and distance networks can be combined to create an authentic writing environment. This functional writing environment can help to create a social context that is needed to enhance the classroom making it a writing community.

Telecommunication networks in classrooms

Computer-mediated telecommunications networks are part of the second generation of microcomputer applications which focuses on computers as tools to support traditional learning (Pea & Sheingold, 1987). The use of computer

networks as a supplement to or substitute for traditional classroom activities is becoming more frequent.

Computer-mediated communication is using the computer to create a link with another computer or computers where communications can occur over distance. Much of the research concerning computer-mediated communication has been in nonacademic settings, but since the mid-eighties researchers in education have been suggesting ways that this new technology can be implemented in the secondary and elementary schools. "Access to a microcomputer, modem, telephone line, and communication program offers learners and teachers the possibility of interactions that transcend the boundaries of time and space" p.xvii (Harasim, 1990). There are a growing number of networks that can link students in a local, regional, national, and international communication exchange that introduce environments into the classroom where social and intellectual connections can be enhanced (Blystone, 1989; Bolter, 1991; Bright, Hunsberger & Labercane 1988; Harasim, 1990, Hiltz, 1989; Moore, 1981; Newman, 1989; Levin & Riel, 1985; Ross et al., 1990).

In a research study using computers for communications between students, Reil (1985, 1989) examined the reading and writing skills of low-achieving fourth and fifth grade students in a computer-supported network. She reported that students' attitudes toward writing improved both on and off

the computer. Students wrote more easily, and with more confidence when given this context for writing.

Similarly, Newman (1989) reported that seventh and eighth grade students began to write longer texts as they researched and shared information with their "computer pals" in distance locations. Newman showed that students' attitudes toward writing and their language development both improved.

Ross, Smith & Morrison (1989) used the computer based network to create a distance tutoring service for students in a fifth grade classroom with student teachers at the university. The evaluations of the student outcomes showed that the computer tutored students did score higher. However, the researchers expressed caution about the results due to extraneous factors beyond their control.

Moore (1991) used telecommunications to allow fifth graders and graduate students to dialogue. She found that the fifth-graders began to refine their understanding of text and their control of the reading/writing process. The electronic dialogue allowed the fifth grade students to communicate with a real audience and this increased their motivation and interest in the sharing of their ideas.

Because of the technology necessary to create a functional learning environment, there has been a limited number of classrooms where the technology has been applied

to the teaching of writing. However, surveys indicate that the availability of computer-mediated networks is certainly feasible in many classrooms and schools today (Becker, 1990). The research cited above suggests that the creation of a function writing environment that uses distance networks can influence the writing skills of young writers.

Summary

The purpose of this chapter was to review previous research in order to provide theoretical frameworks for the pedagogical implications of a functional writing environment on the acquisition of writing. Research involving collaborative learning, writing groups, computers and collaboration was reviewed. Also research that was pertinent in the area of word processing and writing was examined. Finally research in the use of telecommunications to create an environment where writing could be accomplished as a method of communication with a distant audience was also reviewed.

National surveys continue to show that elementary schools are recognizing the computer as a tool in facilitating children's writing development (Becker, 1990). Several researchers describe improvement in children's writing when word processing is used along with increased instruction (Diaute, 1986a; Phoenix & Hanna, 1984). Others

have failed to document that the use of a word processing produces better written documents (Collier, 1983). Even with conflicting results, the fact that computers are being used in the classroom warrants research in how the word processor can be made a more effective tool.

The process model of writing along with the word processing capabilities of the microcomputer complement each other and create a tool and a process of writing that aids students in improving the quality of their writing (Diaute, 1986a; Phoenix & Hannan, 1984) as well as their attitudes toward writing. The increase in the quality of the writing may be attributed to the ease of revisions that is possible with the use of word processing and the social interactions that results from the computer in the classroom.

Both the cognitive and social-interactive theories of writing place a strong emphasis on the development of writing skills within a social context that is meaningful and authentic. Writing is a process that develops out of a desire to communicate within a community. In order to determine the success of communication, students must have a knowledge of writing for communication or for an audience (Ede & Lunsford, 1984) and must be able to view their writing from a detached perspective. Piaget (1926/1959) refers to this skill as decentering.

To understand that writing is communication, students

are increasingly working in groups. Groups can provide feedback and assistance in determining if the intended communication has occurred (Balajthy, 1986). Some researchers have found that peer groups help students to begin to develop a sense of audience (Heap & Moore, 1986), to make more appropriate revisions (Reynolds & Hart, 1990) and to achieve higher scores in writing (Soltis & Walberg, 1989). Hawkins (1985), Bower (1988), and Kurland and Pea (1983) suggest that the way computers are used in the classroom will directly influence girls involvement in the experience.

Studies that examine the effects of cooperative learning have shown that students who worked cooperatively at a task experienced higher achievement (Johnson et al., 1976; Johnson et al., 1978; Slavin, 1983), had a more positive attitude toward learning (Johnson & Johnson, 1983), and developed more tolerance toward diverse opinions than those who worked in competitive situations. Hawkins (1985) and Kurland and Pea (1983) showed that cooperative classrooms significantly improved girls' as well as boys' interaction with the technology.

The computer seems to encourage cooperative learning groups, and students who write cooperatively at the computer seem to develop a sense of audience (Heap & Moore, 1986) and improve the length and complexity of their writing

(Diaute, 1986a). The addition of a distance network that links the classroom, where students are utilizing word processing in a collaborative writing environment, to a distance audience shows potential for influencing the written communication that occurs between the student in the online classroom with a distant audience. This study sought to examine the effect of telecommunications on the writing quality of the students who were using the word processor and writing with a partner of the same sex in a collaborative and cooperative context.

CHAPTER 3. METHODOLOGY

Introduction

This chapter describes the procedures and methods used to examine the effects of a networked functional writing environment on the writing and attitude of the subjects. Specifically, this research study sought to create an environment that used a distance network in an experimental group that allowed interaction between the subjects and a distance audience/response reader. The results of this interaction were measured by how the interaction effected the quality of the writing and the change in attitude when compared with the control group who did not use telecommunications. The research design of this study was constructed to determine if there was a difference in attitude and the quality of writing produced in the experimental and control environment.

The chapter is organized into five sections that describe the following:

1. sample of subjects used in the study
2. development of the instruments used to measure the effects of the treatment
3. research design used in conducting the study
4. procedures and instructional materials
5. procedures for data analysis

In total, these five sections describe the methodology that was incorporated to examine the effect of the functional writing environment on the attitudes of the subjects and quality of writing produced.

Sample

Subjects for this study were fifth grade students enrolled in the Blue Earth Elementary School in Blue Earth, MN. The school is a K-12 school with 1400 students located in a rural community in southern Minnesota. Blue Earth is one of thirteen Apple Classrooms of Tomorrow (ACOT) chosen by Apple Computer, Inc. company to utilize modern computer technology in the educational system. Blue Earth became an ACOT school in 1987 and the fifth grade classes were equipped with one computer for each student. Keyboarding skill instruction began in the third grade.

The classes chosen for the study were four, fifth grade classes and their four teachers. Ninety-three students participated in the study. All ninety-three of the fifth grade students had immediate access to computers in their classroom. Each student used his or her computer as part of the daily classroom routine. There were fifty computers in each of the two team rooms. The two team teachers shared a Macintosh computer which was equipped with a modem, and a telephone line was available. There were two printers in

each of the classrooms.

Since the school has been an ACOT school for several years, the subjects were very experienced with technology. All the fifth grade students had keyboarding skills and had used word processors. The word processor used for this study was Appleworks 3.0. Subjects were also familiar with the writing process and the written language instruction included journals, writing conferences with the teacher, and writing in different subject areas. The students were also familiar with cooperative learning groups. However, they had not written in collaborative groups or pairs before this project.

Readers, who were part of the distance audience that was accessed by the on-line communication, were ten undergraduate students in the School of Education at Iowa State University. Each readers' participation was voluntary but offered the incentive of learning about computers and telecommunications as well as the writing of fifth grade students. Each reader read the writing that was downloaded to a computer system. The readers were instructed to respond in a supportive and nonjudgemental manner to the writing. Each reader responded to several different fifth grade students during the eight week project.

Subject demographic information

Gender Forty-five percent of the total sample was female and 55% male. Forty-three percent of the experimental group was female, and 57% male. Forty-eight percent of the control group was female and 52% male.

Home Computer The data collected indicated that 38% of the total sample had a computer at home. The experimental and control groups were equally divided with 38% of both groups owning a home computer. Thirty eight percent of the males in the experimental group and 35% of the males in the control had a computer at home. The females in both the control and experimental group reported a higher percentage of computers at home than the males. Thirty-nine percent of the females in the experimental group indicated that they had a computer at home and forty-three percent of the control group had computers at home.

Use Home Computer Of the subjects who reported that they had a home computer, over all 88% of them indicated that they used it. In the experimental group 94% of those reporting having a home computer reported using it and 88% of the control group reported using the computer at home. The females in the experimental group reported the highest percentage of home use of computers with 100% of this group indicating that they used their computer at home. Eighty nine percent of the females in the control reported use.

The males in experimental group reported 89% use and the control group reported 88% use.

Use Computer to Communicate The subjects reported almost no knowledge of being able to use the computer to communicate with someone in another place. Responding to the pre-survey, ninety-three percent of the respondents indicated they did not regard communication as a use for computers. In the experimental group, 97.6% of the subjects did not indicate this use and 2.4% did. In the control group 88.6% of the subjects did not indicate this use and 11.4% did.

Instruments

Development of the questionnaire

A demographic and attitudinal questionnaire was adapted to ascertain the subjects' attitude toward the following: (a) writing with computers (b) writing with a partner (c) working with a partner (d) writing for an audience (e) writing with a partner at the computer. This instrument utilized computer attitudinal survey questions developed in the Curriculum and Instructional Technology Department at Iowa State (Allen, 1990; Greer, 1991) as well as statements generated from suggestions in published studies of collaboration using computers (Sullivan, 1989). Statements used to measure the attitude toward writing for an audience

were developed by the researcher. Procedures for constructing the questionnaire were based on information in How to Measure Attitudes (Henerson, Morris, & Fitz-Gibbon, 1978).

The first step in the development of this instrument was to determine the statements that clearly distinguished between favorable and unfavorable attitudes regarding the measured components. A Likert scale with a range of 1 to 5 was used to measure the response. Statements that favored working or writing with a partner, using the computer, or writing for an audience were considered favorable opinions. The majority of statements used were obtained from studies of student attitudes toward the computer (Allen, 1990; Greer, 1991; Sullivan, 1989) and toward collaborative writing (Allen, 1990). The statements measuring students' attitude toward writing for an audience were constructed by the researcher after reviewing the literature and consulting with a university professor who teaches language arts education courses.

Content validity, the degree to which an instrument measures the content it purports to measure, was a primary concern of the researcher. Content validity is most often determined by experts or professionals in the content area. One university professor, one university instructor, two graduate assistants, and two elementary teachers were each

given the draft questionnaire and asked to record their comments and suggestions. It was requested that comments be directed toward the appropriateness of the questionnaire for measuring attitudes toward using the computer, working with a partner, writing with a partner, writing with a computer, writing with a partner at the computer, and writing for an audience. Comments were also solicited for the appropriateness of the questionnaire for fifth-grade students who were familiar with the writing process and the computer. An instruction form that was included with the questionnaires and given to the evaluators can be found in Appendix A. The majority of the comments from the experts related to concerns about the wording of statements or the appropriateness of the content of some statement for measuring the attitudes they were written to measure. Comments and suggestions from these people were used to modify the instrument.

After rewriting and modifying the initial set of questions, a pilot test was conducted in a local elementary school. The twenty-one fifth grade students were familiar with computers and process writing. Each student answered the fifteen questions measuring background and the thirty-four attitude questions. The attitude questions asked students to respond to a five-point Likert agreement scale with the following values: 5=strongly agree, 4=agree, 3=note

sure, 2=disagree, and 1=strongly disagree.

Based on the pilot test fifth graders' comments and suggestions, one of the demographic questions was modified. The resulting questionnaire was tested for reliability and validity.

Reliability of the survey

In order to test the internal consistency of the 34 attitude item instrument, a Cronbach alpha reliability coefficient was obtained for each of the five attitude composites that were formed based on theory of what items should be grouped. The reliability coefficients for the five attitude composites, based on the ninety-three subjects in the study were as follows:

- (a) working with a partner, .72
- (b) writing with a partner, .77
- (c) writing with a computer, .85
- (d) writing to an audience, .79
- (e) writing with a partner at the computer, .81

The overall reliability coefficient for all the thirty-four statements was .78.

The final instrument contained fifteen items measuring background information and thirty-four measuring attitude factors. The individual items that made up the attitude composite groups are as follows:

(a) working with a partner - items, 35,38,39,41,45, and 50.

(b) writing with a partner - items, 16,17,20,21,22, and 33.

(c) writing with a computer - items, 18,19,23,24, 25,26,27,28,29,30,31,32,43, and 48

(d) writing to an audience - items, 17,22,36,37, 40,43, and 46.

(e) writing with a partner at the computer - items, 20,21,42,44, and 47.

These attitude items were randomly distributed throughout the attitude section of the survey questionnaire. After the pilot test, the questionnaire was administered to the ninety-three subjects before the experiment began and again the day after the experiment was concluded. This survey instrument can be found in Appendix B.

Analysis of the pre- and postwriting assignments

The pre- and postwriting assignments were scored using two different instruments. One instrument was a scoring rubric for holistic writing that was devised from published rubrics. The development of this rubric is described below. The pre- and postwriting assignments were also evaluated using readability statistics to determine how effectively a piece of writing communicates. These indexes were all

statistically analyzed to determine if there was a difference in the quality of the pre- and postwritings.

The scorers for the holistic rubric analysis were three instructors in the English Department at Iowa State. These scores attended a training session prior to scoring the writing. Inter-rater reliability was established by developing consistency of rating among the scorers. The scorers classified papers written by fifth graders for similar assignments. After several papers were scored by each rater, and the level of agreement was at least two out of three for the score, the researcher was confident that the level of agreement would be sufficiently high to proceed with the actual sample. The raters received a complete set of all writing to be scored. The papers were coded and all identification was erased. Each rater recorded the score for the individual paper on a record sheet. The score that occurred two out of three times was assigned to the paper. If this agreement was not achieved, a fourth rater was used to reach agreement. The holistic scoring rubric can be found in Appendix C.

The readability analysis index was produced by using Grammatik IV software which is a text analyzer that provides analysis of length and grade level. This analysis will be described in the following section.

Holistic scoring of the writing

Holistic evaluation is a guided procedure for sorting or ranking written pieces. In holistic evaluation, the rater takes a piece of writing and either (a) matches it with another piece in a graded series of pieces, (b) scores the written piece for the predetermined features that were the focus of the writing assignment, or (c) assigns a letter or number grade based on a rubric or check list. This grading, scoring, or placing occurs very quickly (usually within two minutes) as the rater reads the written piece as a whole and judges it by his/her impression of the whole and assigns the piece score. Holistic evaluation is usually guided by a holistic scoring guide, often a rubric or a checklist, which specifically distinguishes the contents of a high quality paper, a medium-quality paper, and a low-quality paper (Cooper, 1977; Quellmalz, 1982).

A scoring rubric which contained the criteria used by the graders was developed by the researcher and compiled from several existing examples and modified to measure the specific traits that were to be assessed. The rubric was created by the researcher after discussion of the evaluation of the written assignments with two language arts methods professors and an English professor. Scores were based on a rating scale which had a range of one to six, with six being the highest possible score on a paper and one being the

lowest. A score of six was rated as very competent. These papers showed organization and the ideas were clear and understandable. There will be enough length to develop all ideas and points. There may be a few mechanical errors, but generally there will be complete sentences, correct punctuation, and correct spelling. At the bottom of the scale, a 1 or 2 will not be competent at all and have a serious lack of organization and supporting details. The content will be extremely thin and there will be errors in mechanics that cause confusion and can interfere with communication. The scoring rubric can be found in Appendix C.

Readability analysis

Readability statistics are a measure of how effectively a piece of writing communicates to the average adult reader. Most readability indexes assign a reading grade level. A Flesch Grade Level of 7, for example, indicates the writing sample can be understood by an average English-speaking reader who has completed seven years of education in the United States.

This study analyzed the readability statistics produced by the Grammatik IV software to determine if there was a difference between the pre- and posttest writing samples. This analysis included the number of words in the text, the

Flesch-Kincaid grade level analysis and the Gunning's Fog Index.

Research Design

The basic experimental design of this study is currently recommended in the methodological literature on experimental designs for research (Campbell & Stanley, 1963). This experimental study used a two group design with random assignment of the existing class to either the control or experimental group. The pretest posttest control group design controls for rival hypotheses such as maturation, history, and testing.

The study employed an analysis of covariance in order to examine the effects of the treatment on postwriting sample as measured by the holistic score and the readability statistics and the change in attitudes as measured by the questionnaire attitude composite items.

Research Procedures

The requisite permission needed to pursue the research was obtained. The proposal for this research study was reviewed and approved by the Iowa State University Human Subjects Committee. Additional permission from the Blue Earth School District, Blue Earth, MN. and the parents of the fifth grade students was acquired.

Arrangements were made with AMERICA ONLINE to open network connections between Blue Earth Elementary and the researcher at Iowa State. The four Blue Earth fifth grade teachers, the elementary school computer coordinator, and the researcher met three times during the summer to discuss the procedures necessary for the research study and the six writing assignments that the students would be doing. The teachers were randomly assigned by a flip of the coin to one of two teams: team one was the team that was the experimental group and used the telecommunications network and team two was the control group.

The study was carried out in the regular classroom setting of the four, fifth grade classes. The four classes were taught by the four teachers who teach in two teams with one male and one female teacher on each team. Each team of two teachers shares the teaching of forty-five students in a large connected classroom. Each student has a IIGS Apple computer assigned to them. The fifty classroom computers are networked to the teachers' computer using a local area network. There is one Macintosh SE computer in each team room that is shared by the two team teachers. The experimental group used the telecommunications network and accessed America Online by using the Macintosh SE, a modem, and the America Online software to utilize the online network. The researcher in Ames, Iowa accessed the same

online network by modem using an IBM compatible PC. Therefore, the Blue Earth staff and the researcher were able to communicate in real-time by conference and by using electronic mail on the America Online network. A list of the equipment used in the experiment is listed in Appendix D.

The study was conducted during a period of eight weeks, September 21-November 13, in the fall semester of 1992. During the first week the online network was accessed and demonstrated to the teachers at Blue Earth. Team one utilized the network communications by conducting preliminary communications where they exchanged messages with the researcher. Real-time online conferences where the Blue Earth staff "talked" with the researcher were scheduled on a regular basis to discuss any concerns or problems that occurred. An example of this communication can be found in Appendix E. The researcher traveled to the elementary school when the students were completing the writing assignments and was present at Iowa State when the writing was being read and responded to by the ISU students.

The two teams were divided into the two major writing environments necessary for the study. Team one wrote in the experimental environment which was a computer based cooperative writing environment and the on-line network. The commercial network, AMERICA ONLINE, provided the connection between Blue Earth students and the students

at Iowa State. Team two was the control where cooperative, computer based writing experience were contained within the classroom with the teacher as the only audience for the students' writing.

During the first week of the study, all students were given an explanation of the research and the questionnaire to complete. Individual pairs of the same gender were selected by the teachers. The selection was made on the basis of the teacher's opinion of students who would work well together. These two students wrote the pre- and post-assignments and the four intermediate assignments together.

The study required that all the students write a cooperative writing assignment with their partner as a pretest during the first week. During the next six weeks, the pair wrote four compositions together. These four writing assignments were agreed upon by all four teachers and the researcher. The assignments were identical for both the control and experimental teams. The amount of time allowed to complete the writing as well as the amount of teacher help that was given was essentially the same for both groups. The time for each writing assignment was two days in the afternoon language arts period that was approximately one hour long. The writing pair worked as a team producing one paper. The researcher collected the final draft of each assignment from the experimental group by down

loading online the material from Blue Earth and compiling the writing on floppy disks and then printing out a copy. The control group printed a hard copy of the writing and saved the work on a floppy disk. These were collected at the end of the study.

The writing assignments

The second week the students wrote the first of four writing assignments. The first writing assignment was explained and discussed. The students who were given the network assignment had additional instructions about the use of networks and how messages are sent and retrieved. The groups were given an adequate, and equal, amount of time to complete the writing assignment as agreed upon by all four teachers and the researcher. The four writing assignments were completed in the six week period.

In all the writing assignments there was a deliberate attempt to create assignments that could include both partner's viewpoints. Attempt was also made to keep the assignment "gender free" so that there was no gender bias in the initial assignment and each member of the writing team had a fair chance to contribute ideas.

The four writing assignments were written by the researcher after consultation with two professors who teach elementary language arts methods courses. Then the

researcher met with the teachers and discussed modifications. There was consensus and approval from all four of the participating teachers. The teachers agreed on the time that would be allowed to complete the assignments and the amount of help they would give. The teachers were given written instructions for each assignment which they read aloud to the students. After hearing the prompt for the writing, the students suggested ideas for things that could be included in the writing. Then the students wrote with their partner to complete the assignment.

One of the four writing assignments can serve as an example of the type of writing assignment that was given for each writing. The second writing assignment was to write about inventions and the following prompt was given:

"Inventions are things that people have made to make our lives easier and more fun. Think of a new invention that you and your partner can make. Describe what your new invention will do and how it will look. Explain how you think it will help people or be fun to use." All four assignments and the and posttest can be found in Appendix F.

Each writing pair made preliminary decisions such as the typist responsibilities and the turn taking order of the typist. The rules of cooperative learning were reviewed: conflicts should be resolved by consensus; criticize ideas, not people; listen to your partner's ideas even if you don't

agree with him/her.

For each writing the students were encouraged to use process writing that they normally used in writing in their classroom. The writing session began with the teacher reading a description of the assignment. Then the group as a whole discussed ideas about what could be included in the writing. After several ideas were generated, the writing partners began to work together to come up with additional ideas or to decide which ideas they wanted to include in their writing. The students then began to write. After completing a first draft, they revised and rewrote until they were satisfied the writing was complete. There was a time constraint that both the experimental and control group had agreed on and followed.

All writing assignments were completed within a two day time limit.

The reader response

After the experimental group at Blue Earth completed each writing assignment was transmitted via America Online to the researcher at Iowa State by the Blue Earth computer coordinator and the teachers. The students' writings were then accessible to the Iowa State students who responded to the experimental group's writing within three days. The Iowa State students were instructed to respond to the

students' writing in a positive and nonjudgemental manner. They read the writing that was downloaded on AMERICA ONLINE and wrote a response. This response was sent back to Blue Earth over the network. The Blue Earth teachers checked their "mail box" each morning and when the written responses from the Iowa State students arrived, they were printed out. The written response to the each pair's assignment arrived within three days, usually within two. Each pair of students received a return message from an Iowa State student for each writing assignment.

The students in the control group also wrote their assignments with their partner. The teachers in the control group read and responded to the students' writing as they would normally by making comments and suggestions for improvement.

The final week was used to write the posttest collaborative assignment. The pretest and posttest writing samples were used to analyze any difference in writing between the two groups as well as any difference between female and male writing pairs. This week was also used to administer the post-questionnaire survey on attitude.

Analysis of Data

The data collected through the pre- and postattitude questionnaires were analyzed using frequency distributions and analysis of covariance to determine if there were changes in the students' responses. Data from writing samples, collected before and after the treatment, were analyzed using an analysis of covariance to factor out initial differences and determine if there was a statistically significant difference in the final product.

CHAPTER 4. RESULTS AND FINDINGS

Introduction

The purpose of this chapter is to present the results of the statistical analysis applied to the data collected from the research instruments. The study focused on the effects of telecommunications on writing and attitude. To achieve the purpose of the study, the treatment (a networked telecommunications audience) was implemented as the independent variable. The dependent variables in the study which were the holistic score, readability scores, and attitude composites were measured by administering the research instruments.

This chapter is organized into four sections. In the first section, findings from the demographic section of the survey are presented. In the second section, each of the research questions is presented and relevant findings are summarized. Auxiliary findings that were not included in the research questions are presented in the third section. The final section of the chapter provides a summary of the research results.

Analysis of Demographic Survey

As stated in Chapter 3, a questionnaire designed to provide information about the students and their use of

computers was administered to the subjects to collect data on gender, availability of a home computer, knowledge of the use of computers for communications, solving problems related to the computer, and ability to use the computer to keyboard. A summary of the demographics reported in detail in Chapter 3 is discussed in the following section.

A frequency distribution was used to determine the occurrence of the following selected facts that existed in the control and experimental groups: gender, availability of a home computer, knowledge of the use of computers for communications, who can help solve problems with computer, ability to keyboard and use of word processing.

The results of the frequency count indicated that the control group was 48.4% female and 51.6% male and the experimental group was 43.3% female and 56.7% male. The percentage of students having home computers was almost exactly the same for both groups. In the control group, 38.6% had a computer at home and 38.4% of the experimental had one. Results from a question regarding the subjects' knowledge of the use of computers for communications indicated that 93% of the control and the experimental group did not see this as a use when they completed the presurvey. However, in the postsurvey the experimental group indicated a significant increase in understanding this use with 67.8% of the students in the experimental group indicating that

communications is something for which computers can be used.

Results from a question regarding asking a classmate for assistance revealed that the percentage of students in the experimental group who would ask another student for help on the prequestionnaire was 66.7% and in the post-questionnaire it was 82.6%, an increase of 15.9%. In the control group the first questionnaire percentage was higher than the experimental with 78.7% indicating that they would ask help from another student. This only increased by 2.2% to 80.9% in the postquestionnaire for the experimental. The results from the question regarding using the computer for word-processing indicated that almost all the subjects could use the computer for word processing with 100% of the control group responding positively to this use and 97.6% of experimental group.

The results of the demographic survey indicated that the students in this study were familiar with computers and could use the computer for word processing. After the treatment, the experimental group show a large percentage increase in the number of students who realized that computers can be used for communications.

Research Question One

Research question one was stated as follows:

Will there be a difference in the writing produced as measured by holistic scoring and readability analysis when a student is assigned to the experimental telecommunications writing environment or the control group?

Holistic score

The holistic scores on the writing posttest sample ranged from 2 to 6 for the experimental group and from 1 to 5 for the control out a possible range of 1 to 6. After adjusting for the covariate, the writing holistic score on the writing pretest sample, the total sample mean was 3.40. The mean score on the holistic rating for the postwriting sample for the experimental group was 3.73 and the mean score for the control group was 3.12. Therefore, the experimental group scored 0.61 points higher on the average than the students in the control group (Table 1).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if a statistically significant difference existed. The data showed that a statistically significant difference existed between the experimental and control groups on the average score of the postwriting sample while adjusting for initial difference with the pretest score, $F(1,78)=11.11$, $p<.001$. The data revealed

that students with the telecommunications audience received a higher average score on the holistic scoring than the students with the teacher audience (Table 2).

Word count

The word count on the postwriting ranged from 91 to 341 words for the experimental group and from 41 to 260 for the control. After adjusting for the covariate, the word count on the writing sample, the total sample mean was 142.81. The mean for the experimental word count on the postwriting sample was 173.75 and for the control 114.02. Therefore, the experimental group wrote 59.73 more words on the average than the students in the control group (Table 3).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if a statistically significant difference existed. The data showed that a statistically significant difference existed between the experimental and control groups on the average word count of the postwriting sample when adjusted for initial differences, $F(1,87) = 74.77, p < .001$. The data revealed that students with the telecommunications audience wrote texts of longer length than the students with the teacher audience (Table 4).

Flesh-Kincaid Index

The Flesh-Kincaid Index scores on the readability analysis of the postwriting sample ranged 1.7 to 7.8 for the experimental and from 1.9 to 18.3 for the control. After adjusting for the covariate, the scores on the writing sample, the total sample mean was 5.25. The mean score on the Flesh-Kincaid index for the postwriting sample for the experimental group was 5.70 and for the control it was 4.82. Therefore, the experimental groups scored 0.88 points higher than the control group (Table 5).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if a statistically significant difference existed. The data revealed that there was no significant difference between the experimental and control groups, $F(1,87)=2.24$, $p<.138$. The data reveals that there were no statistically significant differences between the experimental and control groups on the Flesh-Kincaid grade level index (Table 6).

Gunning's Fog Index

The scores on the Gunning's Fog Index posttest ranged from 12.6 to 5.7 for the experimental group and for the control from 20.4 to 4.6. After adjusting for the covariate, the scores on the Gunning's Fog Index pretest, the total sample mean was 7.83. The mean score on the

Gunning's Fog Index for the postwriting sample for the experimental 8.62 and for the control was 7.08. Therefore, the experimental group rated 1.54 points higher on the Gunning's Fog Index than the control group (Table 7).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if a significant difference existed. The data showed there was a statistically significant difference between the experimental and control groups on the average score of the postwriting sample when adjusted for initial differences, $F(1,87) = 5.63, p < .020$. The data reveals that the students with the telecommunications audience scored significantly higher on the Gunning's Fog Index score than the students with the teacher audience (Table 8).

Table 1. Means and standard deviations for the holistic score of the experimental and control groups.

Total Sample Mean 3.40 (N=90)				
Treatment	N	Mean	Adj. Mean	Standard Dev.
Experimental	44	3.64	3.73	.88
Control	46	3.17	3.12	1.28

Table 2. Analysis of covariance for the holistic scores of the experimental and control groups and writing pairs.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate					
PreScore	36.37	1	36.37	58.03	.001***
Main Effects					
Group	6.96	1	6.96	11.11	.001***
Sex	7.18	1	7.18	11.46	.001***
Explained	52.99	4	13.24	21.13	.001
Residual	48.89	78	.62		
Total	101.88	82			

Table 3. Means and standard deviations for the word count.

Total Sample Mean 142.81 (N=90)				
Treatment	N	Mean	Adjusted Mean	Standard Dev.
Experimental	44	171.04	173.75	10.75
Control	46	111.08	114.02	8.93

Table 4. Analysis of covariance for the word count on the post writing samples of the experimental and control groups.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
<hr/>					
Covariate					
PreCount	69559.00	1	69559.00	27.12	.000***
Main Effects					
Group	191811.18	1	191811.18	74.77	.001***
Explained	261370.18	2	130685.09	50.94	.000***
Residual	223185.64	87	2565.35		
<hr/>					
Total	484555.82	89			
<hr/>					

Table 5. Means and standard deviations for the Flesh-Kincaid index.

Total Sample Mean 5.25 (N=90)				
Treatment	N	Mean	Adjusted Mean	Standard Dev.
Experimental	44	5.44	5.70	.273
Control	46	5.13	4.82	.475

Table 6. Analysis of covariance for the Flesh-Kincaid index scores of the experimental and control groups.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate PreFlesh/ Kincad	33.086	1	33.086	5.065	.027
Main Effects Group	14.663	1	14.663	2.24	.138
Explained	47.74	2	23.87	3.65	.030
Residual	568.35	87	6.53		
Total	616.10	89			

Table 7. Means and standard deviations for the Gunning's Fog Index.

Total Sample Mean 7.83 (N=90)				
Treatment	N	Mean	Adjusted Mean	Standard Dev.
Experimental	44	8.31	8.62	1.87
Control	46	7.46	7.08	3.13

Table 8. Analysis of covariance for the Gunning's Fog Index scores of the experimental and control groups.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate PreGunning	6.015	1	6.015	.936	.336
Main Effects Group	36.180	1	36.180	5.63	.020**
Explained	42.196	2	21.098	3.28	.042
Residual	558.877	87	6.424		
Total	601.073	89			

Research Question Two

Research Question two was stated as follows:

Will there be a difference in quality of writing produced as measured by the holistic scores when students are paired as male or as female writing partners?

The holistic scores on the writing posttest sample ranged from 1.00 to 5.00 for the male writing partners and from 2.00 to 6.00 for the female writing partners. After adjusting for the covariate, the score on the prewriting sample, the total sample mean was 3.63. The mean holistic score on the postwriting sample for the males was 2.98 and

for the females was 3.87. Therefore, the female writing partners scored .89 points higher than the male writing partners (Table 9).

An analysis of covariance (ANCOVA) was used to determine if there was a difference in the writing based on the gender of the writing partners. The ANCOVA used the results of the preholistic writing score as the covariate to adjust for initial differences. The results of the ANCOVA revealed that a significant difference on the holistic score existed between the males and females, $F(1,78) = 11.46, p < .001$. Therefore, the researcher can conclude that the female partners in the study received higher average scores on the holistic scoring than the male writing partners (Table 10).

Table 9 . Means and standard deviations for the male and female writing partners on the holistic score of the posttest writing sample.

Total Sample Mean 3.63 (N=90)				
Treatment	N	Mean	Adjusted Mean	Standard Dev.
Males	44	2.75	2.98	0.72
Females	46	4.13	3.87	1.03

Table 10. Analysis of covariance for the holistic scores of the males and females.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate					
PreScore	36.37	1	36.37	58.03	.001***
Main Effects					
Group	6.96	1	6.96	11.11	.001***
Sex	7.18	1	7.18	11.46	.001***
2-Way Inter-					
Actions	1.22	1	1.22	1.98	.167
Sex/Group	1.22	1	1.22	1.98	.167
Explained	52.99	4	13.24	21.13	.000
Residual	48.89	78	.62		
Total	101.88	82			

Research Question Three

Research Question three was stated as follows:

Will there be a difference in male students' and female students' attitudes toward the following composites: writing with a computer, writing with a partner at the computer, and writing to an audience?

Students' attitude scores were measured using scales that were composed of certain attitude items classified in the following composites: writing with a computer, writing with a partner at the computer, and writing to an audience

on the questionnaire designed by the researcher. The mean of attitude items was computed for each attitude composite. There were three composite scores from the questionnaires completed before and after the research study. Scores on the questionnaires for these attitude composites will be discussed by each of the three composite groups. An analysis of covariance (ANCOVA) was used to determine if there was a difference between males' and females' attitudes toward each of the composites. The results of the prequestionnaire composite were used as a covariate to adjust for initial differences.

Writing with a computer

Average item scores for the attitude composite "writing with a computer" questionnaire (items 18,19,23,24,25, 26,27,28,29,30,32,34, & 48) ranged from 2.78 to 4.67 for the group as a whole. The mean score for this composite scale on the pretest questionnaire for females was 3.88, SD=.59 and for males was 3.82 with SD=3.83. The posttest items ranged from 2.71 to 5.00 with a mean score of 4.02, SD=.52. The mean score for this composite scale on the posttest questionnaire for females was 4.09 with SD=.48 and for the males it was 3.91, SD=.56.

The attitude difference of males and females toward writing with a computer was determined using an ANCOVA with

the prequestionnaire composite items results as a covariate to adjust for initial differences. After adjusting for the covariate, the total composite mean was 3.99. The mean score on the writing with a computer composite for the females was 4.08 and the mean for the males was 3.92. Therefore, the females score .16 points higher on this attitude composite than the males (Table 11).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if this was a statistically significant difference. These results indicated that there was no significant difference between the attitude toward writing with a computer of the males and females, $F(1,83)=2.90$, $p<.092$ (Table 12).

Writing with a partner at the computer

Average item scores for the attitude composite "writing with a partner at the computer" questionnaire (items 17,22,36,37,40,43, & 46) ranged from 2.10 to 3.36 for the composite as a whole. The mean score for this composite scale on the pretest questionnaire was 3.01 for females, $SD=.66$ and 2.66 males, $SD=.73$. The posttest items for 2.49 $SD=.83$ females and 2.51 with $SD=.83$ for males.

The attitude difference of the males' and females' toward writing with a partner at the computer was determined using an ANCOVA with the prequestionnaire composite items

used as a covariate to adjust for initial differences. After adjusting for the covariate, the mean composite was 2.50. The mean score for the writing with a partner at the computer for the females 2.46 and for the males it was 2.54. Therefore, the males scored .08 points higher than the females on this attitude composite (Table 13).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if this difference was statistically significant. These results indicated that there was no significant difference between the attitude of the males and females toward writing with a partner at the computer, $F(1,83) = .174, p < .677$ (Table 14).

Writing to an audience

Average items scores for the attitude composite "writing to an audience" prequestionnaire (items 17,22,36, 37,40,43,46, & 49) ranged from 3.15 to 4.10 for the group as a whole. The mean score for this composite scale on the prequestionnaire for females was 3.94 $SD = .58$ and for males was 3.17 $SD = 3.17$ with $SD = .74$. The posttest items ranged from 3.14 to 4.42 for the group as a whole. The mean score for this composite scale on the post questionnaire for females was 3.94 $SD = .53$ and for males was 3.38 $SD = .80$ (Table 15).

The attitude difference of the females and males toward writing to an audience was determined using an ANCOVA with the prequestionnaire composite items used as a covariate to adjust for initial differences. After adjusting for the covariate, the total composite mean was 3.64. The mean score on the writing to an audience composite for the females was 3.70 and males was 3.59. Therefore, the females scored .11 points higher on this attitude composite than the males.

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if this was a statistically significant difference. The results indicated there was no significant difference between the attitude toward writing for an audience for the males and females, $F(1,83)=.626$, $p>.431$ (Table 16).

Table 11 . Means and standard deviations for writing with a computer attitude composite for males and females.

Total Sample Mean 3.99 (N=86)				
Attitude Writing/Comp	N	Mean	Adjusted Mean	Standard Dev.
Males	47	3.91	3.92	.56
Females	39	4.09	4.08	.48

Table 12. Analysis of covariance for the composite items of attitude of males and females toward writing with computers.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate					
PreScore	7.73	1	7.73	40.41	.000***
Main Effects					
Sex	.56	1	.56	2.90	.092
Explained	8.29	2	4.14	21.65	.000
Residual	15.87	83	.19		
Total	24.15	85			

Table 13. Means and standard deviations for writing with a partner at the computer attitude composite for males and females.

Total Sample Mean 2.50 (N=86)				
Attitude Wri/Prt/Comp	N	Mean	Adjusted Mean	Standard Dev.
Males	47	2.51	2.54	.83
Females	39	2.49	2.46	1.04

Table 14. Analysis of covariance for the composite items measuring attitude toward writing with a partner at the computer of males and females.

Source of Variation	Sum of Squares	df	Mean Square	F	of F	Signif.
Covariate						
PreScore	26.766	1	26.766	48.048		.001***
Main Effects						
Sex	.097	1	.097	.174		.677
Explained	26.863	2	13.432	24.111		.000
Residual	46.236	83	.557			
Total	73.100	85				

Table 15. Means and standard deviations for writing for an audience attitude composite for males and females.

Total Sample Mean 2.50 (N=86)				
Attitude Wri/Aud	N	Mean	Adjusted Mean	Standard Dev.
Males	47	3.38	3.59	.80
Females	39	3.94	3.70	.53

Table 16. Analysis of covariance for the composite items measuring attitude toward writing to an audience of males and females.

Source of Variation	Sum of Square	df	Mean Square	F	Signif. of F
Covariate PreScore	19.597	1	19.597	59.983	.000***
Main Effects Sex	.204	1	.204	.626	.431
Explained	19.801	2	9.901	30.304	.000
Residual	27.117	83	.327		
Total	46.918	85			

Research Question Four

Research question four was stated as follows:

Will there be a difference in students' attitudes toward writing with a computer, writing with a partner at the computer, working with a partner, writing with a partner, and writing to an audience when a student is assigned to the experimental or the control group?

Writing with a computer

An average item score for the attitude composite writing with a computer was determined to compare the

experimental and control group's response to the items. The mean score for this composite scale on the prequestionnaire for the experimental was 3.65 with $SD=.54$ and for the control was 4.03 with $.54$ SD. The postquestionnaire items mean score for this composite was 3.92 with $.55$ SD for the experimental and 4.06 with $.51$ SD for the control.

The attitude difference of the experimental and control group toward writing with a computer was determined using an ANCOVA with the prequestionnaire composite items used as a covariate to adjust for initial differences. The mean score for this composite correcting for initial difference for the total population was 3.99, for the experimental was 4.12 and for the control was 3.96. Therefore, the experimental group scored .16 points higher on this attitude composite than the control. The attitude score of the experimental group increased from 3.65 to 4.12 but the score for the control decreased .10 from 4.06 to 3.96 (Table 17).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if this was a statistically significant difference. These results indicated there was no significant difference in the two groups on the attitude composite of writing with a computer, $F(1,83)=.385$ $p<.537$ (Table 18).

Writing with a partner at the computer

Average item scores for the attitude composite "writing with a partner at the computer" prequestionnaire was 2.43, $SD=.95$ for the experimental and 2.48, $SD=.80$ for the control. The postquestionnaire composite had a mean of 2.46, $SD=.99$ for the experimental and 2.55, $SD=.86$ for the control group.

The attitude difference of the experimental and control group toward writing with a partner at the computer was determined using an ANCOVA with the pretest composite items used as a covariate to adjust for initial differences. After adjusting for the covariate, the total composite mean score was 2.50. The mean score for the experimental group was 2.47 and for the control 2.53. The control group scored .06 points higher on this composite (Table 19).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if this difference was significant. These results indicated that there was no significant difference in the experimental and control groups on this attitude composite $F(1,83)=.139$, $p<.710$ (Table 20).

Working with a partner

Average item scores for the attitude composite working with a partner prequestionnaire was 3.26 with $SD=.69$ for the

experimental and 3.03 with $SD=.60$ for the control. The postquestionnaire had a mean of 2.94 with $SD=.74$ for the experimental and 3.08 with $SD=.58$ for the control group.

The attitude difference of the experimental and control group toward working with a partner was determined using an ANCOVA with the pretest composite items used as a covariate to adjust for initial differences. The mean score for this composite after adjusting for initial differences for the total population was 3.01. The mean score for the experimental group was 2.88 and 3.14 for the control. The control scored .74 points higher on this attitude composite than the experimental (Table 21).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if this was a statistically significant difference. These results indicated that there was no significant difference in the experimental and control groups on this attitude composite, $F(1,82)=4.45$, $p<.038$ (Table 22).

Writing with a partner

Average item scores for the attitude composite writing with a partner prequestionnaire was 2.84 $SD=.71$ for the experimental and 2.76, $SD=.73$ for the control. The postquestionnaire had a mean of 2.84 $SD=.91$ for the

experimental and 2.91 SD=.77 for the control group (Table 23).

The attitude difference of the experimental and control groups toward writing with a partner was determined using an ANCOVA with the prequestionnaire composite items used as a covariate to adjust for initial differences. The mean score for this composite after adjusting for initial differences for the total population was 2.50. The mean score on the writing with a partner composite for the experimental group was 2.46 and for the control 2.55. The control group scored .09 points higher on this attitude composite than did the experimental group.

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if this was statistically different. These results indicated that there was no significant differences in the experimental and control groups on this attitude composite, $F(1,83)=.139$, $p<.710$ (Table 24).

Writing to an audience

Average item scores for the attitude composite "writing to an audience" prequestionnaire was 3.67 SD=.73 for the experimental and 3.36, SD=.79 for the control. The postquestionnaire had a mean of 3.75 SD=.66 for the experimental and 3.53 SD=.80 for the control group.

The attitude difference of the experimental and control group toward writing to an audience was determined using an ANCOVA with the pretest composite items used as a covariate to adjust for initial differences. The mean score for this composite after adjusting for initial difference for the total population was 3.64. The mean score for the experimental was 3.75 and for the control 3.53. Therefore the experimental group scored .22 points higher than the control (Table 25).

An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if this was a statistically different score. These results indicated there was no significant difference between the experimental and control groups on this attitude composite $F(1,83)=.045$, $p<.832$ (Table 26).

Table 17. Means and standard deviations for writing with a computer attitude composite for experimental and control groups.

Total Sample Mean 3.99 (N=86)				
Attitude Wri/Aud	N	Mean	Adjusted Mean	Standard Dev.
Experimental	42	3.92	4.12	.55
Control	44	4.06	3.96	.51

Table 18. Analysis of covariance for the composite items measuring attitude toward writing with a computer of the experimental and control groups.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate PreScore	7.727	1	7.72	39.224	.000***
Main Effects Group	.076	1	.076	.385	.537
Explained	7.803	2	3.901	19.805	.000
Residual	16.350	83	.197		
Total	24.153	85			

Table 19. Means and standard deviations for writing with a partner at the computer attitude composite for experimental and control groups.

Total Sample Mean 2.50 (N=86)				
Attitude Wri/Part/Comp	N	Mean	Adjusted Mean	Standard Dev.
Experimental	42	2.46	2.47	.99
Control	44	2.55	2.53	.86

Table 20. Analysis of covariance of composite items measuring attitude toward writing with a partner at the computer of the experimental and control groups.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate					
PreScore	26.766	1	26.766	48.028	.000***
Main Effects					
Group	.077	1	.077	.139	.710
Explained	26.843	2	13.422	24.083	.000
Residual	46.256	83	.557		
Total	73.100	85			

Table 21. Means and standard deviations for working with a partner attitude composite for experimental and control groups.

Total Sample Mean 3.01 (N=86)				
Attitude Work/Part	N	Mean	Adjusted Mean	Standard Dev.
Experimental	42	2.94	2.88	.74
Control	44	3.08	3.14	.58

Table 22. Analysis of covariance for the attitude composite of working with a partner at the computer of the experimental and control groups.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate					
PreScore	9.395	1	9.395	28.943	.001***
Main Effects					
Group	1.445	1	1.445	4.450	.038**
Explained	10.839	2	5.420	16.697	.000
Residual	26.617	82	.325		
Total	37.456	4			

Table 23. Means and standard deviations for writing with a partner attitude composite for experimental and control groups.

Total Sample Mean 2.50 (N=86)				
Attitude Work/Part	N	Mean	Adjusted Mean	Standard Dev.
Experimental	42	2.84	2.82	.71
Control	44	2.91	2.94	.77

Table 24. Analysis of covariance for the attitude composite writing with a partner.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate					
PreScore	26.766	1	26.766	48.028	.000***
Main Effects					
Group	.077	1	.077	.139	.710
Explained	26.843	2	13.422	24.083	.000
Residual	46.256	83	.557		
Total	73.100	85			

Table 25. Means and standard deviations for writing to an audience attitude composite for experimental and control groups.

Total Sample Mean 3.99 (N=86)				
Attitude Work/Part	N	Mean	Adjusted Mean	Standard Dev.
Experimental	42	3.75	3.65	.66
Control	44	3.53	3.63	.80

Table 26. Analysis of covariance for the attitude composite toward writing to an audience of the experimental and control groups.

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariate PreScore	19.597	1	19.597	59.566	.000***
Main Effects Group	.015	1	.015	.045	.832
Explained	19.612	2	9.806	29.806	.000
Residual	27.306	83	.329		
Total	46.918	85			

Qualitative Findings

An analysis of the notes collected by the researcher during the exit interviews is presented below. The interview was conducted with ten students, five males and five females who were chosen by the teacher. Student comments are discussed in relation to their response to writing with a partner and writing for an audience.

Student exit interviews

Excerpts of the exit interviews with students indicated that the students had reservations about writing with a

partner. A sampling of their comments about writing partners suggests that they realized there were good reasons to write with a partner, but that it wasn't always the way they would choose. The prompts for these responses were: "Would you rather write alone or with a partner? What do you think you learned by writing together?"

Student 1: "I liked writing with my partner. It was easier except when we disagreed then it took time to agree on what to write. I would like it (writing with a partner) if we wrote 2 or 3 times together, then changed."

Student 2: "Writing with a partner was easier and we had more ideas and could write longer. But sharing ideas was slow, I write faster when I don't have a partner."

Student 3: "Yes, I liked writing with my partner but if I write by myself I can do what I want to do. I would like it if I could choose my partner. I would like to choose someone so I could help them."

Student 4: "It was o.k. You have to learn to cooperate. We each took turns and wrote sentence by sentence."

Student 5: "We shared ideas and took turns at the keyboard. She wrote one paragraph and I wrote one. I like to listen to the other ideas but I would rather write by myself."

Student 6: "It would depend on the assignment. If it was a problem solving assignment it would be good to have a

partner. If it was an opinion, I would like to be alone. I learned you can get lots more ideas but it is hard to mix them. I wanted to type in all my ideas."

Student 7: "I wasn't into partners. The partner didn't work. If I could choose my partner, it would have been better. But I did see that we got different ideas. I can't know all the good ideas."

The comments recorded about the telecommunications audience were altogether positive. The prompt used for these reactions was "Tell me what it was like to write to someone on the network?"

Student 1. "I got ideas back! In a letter you know who you are writing to. Meet different people online and get different ideas. We know what the teachers are going to say but with different readers we were surprised."

Student 2. "I like having something to write about and having someone read it."

Student 3. "I like writing to people. I think this is a good experience."

Student 4. " I like to write for someone I don't know because it's fun to get responses. I like surprises too. Another thing, the people I write to are very creative with sending letters back to me and my buddy."

Student 5. "I like my penpal so far. She sounds nice."

Student 6. " I am glad they wrote back. I like it better than just writing for a grade. I love to get letters. I don't get them very often at all."

Student 7. "It's strange knowing someone else is reading what I write."

Student 8. "I'm writing to someone."

Summary

In this chapter, results were reported from the examination of the questionnaire and survey instrument, the holistic scores, and the readability analysis. In the first section, the results of the demographics survey revealed that the two groups were comparable on the measures reported.

In the second section, the results relating to the four research questions were reported. An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if a statistically significant difference existed.

The results of the analysis of question one indicated there was a statistically significant difference in the holistic scores and word count between the experimental and control groups. The readability analysis did not indicate a significant difference between the two groups.

The results of question two indicated that there was a statistically significant difference in the holistic scores of the male and female partners with the female partners scoring significantly higher than the males on the holistic scores on the post writing sample.

Questions three and four analyzed the differences in students' attitudes toward the composite factors. An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if a statistically significant difference in the change in the students response occurred. The data indicated that there was not a significant difference in the attitude of students after the experimental treatment.

The qualitative findings from the exit interview of ten students indicated that there were mixed reactions to writing with a partner. The reaction to writing to an audience using telecommunications network was almost entirely positive.

CHAPTER 5. SUMMARY, DISCUSSION, RECOMMENDATIONS, AND CONCLUSION

The purpose of this chapter is to summarize the research study, discuss the findings, present recommendations for functional writing environments in further research, and draw conclusions about the findings of this research. The chapter is organized into the following sections:

1. A brief summary of the research study
2. Discussion of the findings
3. Recommendations for further research
4. Concluding remarks

Summary of the Research Study

The focus of the research was to examine the potential effects of a functional writing environment which included computers, telecommunications, and cooperative writing groups on the written texts of young writers. The first goal was to investigate the effects of this environment on the quality of writing. The second goal was to investigate if there was a change in attitude of the participants in relation to the gender of the partners and to type of the writing environment that they were assigned.

Development of the study

Research in writing acquisition suggests that young writers who are developing their writing skills need a social environment that encourages writing as a form of communication. Other research in the use of computers in the classroom suggests that students who work in cooperative groups using word processing will have a more positive attitude toward the computer, their peers, and writing than student who do not write together. As more classrooms are equipped with computers, a logical development of technology infusion is the addition of a modem and software that allows distant communications. Using the computer for word processing the text and writing collaboratively with a partner, then having the ability to communicate with a distant reader via a telecommunications network should create an environment that positively affects the written products and attitude of students.

The purpose of this study was to compare the effectiveness of a writing environment with telecommunications that established an audience outside the classroom with a writing environment that did not include the telecommunications and where the teacher was the audience for the writer. This comparison was made by measuring the first and final written product of the writing partners by holistic scores, length, and other readability

analysis measures. Analysis was also made on the students' attitudes toward writing at the computer as well as writing to an audience before and after the study.

Four classes with ninety-three, fifth-grade students from Blue Earth, Minnesota participated in this study. The school is an Apple Classroom of Tomorrow (ACOT) school that infuses computer technology in the classroom at each grade level. For example, students begin learning keyboarding in the third grade and word processing in the fourth. The fifth grade has ninety-five computers which is enough for each student to have their own personal computer. The teachers use the computer as an intricate part of their curriculum not as a supplementary activity.

The research focused on the possible effects of adding distant communications to this classroom environment. First, the effect of the telecommunications audience on the writing was measured by holistic scores and readability analysis of the written text. Second, the effect of this telecommunications on the attitude of the students toward various factors was also measured using an attitude questionnaire.

Methodology

The subjects for this study were ninety-three fifth grade students enrolled in a rural midwest K-12 school of

1400 students. The students were all familiar with computers and technology, and each knew how to use the computer to word process. At the beginning of the study, a questionnaire was given to each student to obtain demographic data and to ascertain the attitude of the student toward writing with computers and writing to an audience. A writing assignment was given at the beginning of the study to determine a base line score for the students writing with their partner.

The eight week study encompassed a pretest and posttest attitude questionnaire, and pretest and posttest writing samples. Four writing assignments were completed in the six weeks between the pretest and the posttest writing. All writing assignments were completed with the same partner. The partners were selected by the teacher with the researcher requiring the partners to be the same sex. The student pairs collaborated on all of the six writing assignments. All writing assignments used prompts which encouraged the students to use the writing process and to interact as they wrote the assignment.

In the experimental group, the written texts were sent by modem and America Online to readers at Iowa State. These readers became the distant audience who commented on the students' writing in a nonjudgemental and supportive manner. The Iowa State readers responded to the Blue Earth

students within three days. In the control group, the teachers collected and responded to the writing in their usual manner by making corrections, giving an evaluation, and choosing certain assignments to be placed in the student's writing portfolio.

The first and last writing assignments, which were used as the pre- and posttest samples, were written to be as much alike as possible. The first writing used as the pretest was to write a description of the student's school and the last which was used as the posttest was to write a description of their town. These two writing were holistically scored on a scale from one to six by independent graders. These writings were also scored by a readability analysis program in Grammanik IV which measured length and grade index.

The data collected from the pre- and postattitude questionnaires were scored on a Likert-type agreement scale of one to five with a score of five representing a positive attitude. Attitude items which were negatively worded on the questionnaire were reverse scored before analysis. Composite groups were formed from theory and the reliability of each composite group was analyzed using SPSS procedures which produced a Cronbach alpha reliability coefficient. Data from the writing samples collected before and after the treatment were analyzed using an analysis of covariance to

factor out initial differences in the two groups and to determine if there was a statistically significant difference in the final product. The alpha level for the study was set at 0.05.

Collected data were analyzed using the SPSS statistical program. The statistical techniques used were:

1. Descriptive statistics were used to obtain a general picture of the sample regarding the familiarity with computers. Those statistics included frequencies, percentages, means, and standard deviations.

2. An analysis of covariance was used to factor out initial differences and to determine if there was a statistically significant difference in the two groups on the holistic scores, word count, Flesh-Kincaid, and Gunning's Fog analysis as well as the attitude composites.

3. A reliability analysis was used to determine the reliability of the composite groups on the attitude questionnaire.

Results of the study

Descriptive analysis of the demographic survey was reported. The researcher noted that there were no major differences between the two groups on the following characteristics: (1) computers at home or (2) distribution of males and females in the two groups.

The response to the question relating to the use of computers to communicate indicated there was a significant difference between the pre- and the postquestionnaire in the percentage of students who responded that computers could be used to communicate. The experimental group's response was significantly higher after their experience with the telecommunications treatment. Analysis of the postquestionnaire indicated that 67.8% of the students in the experimental group responded that computers could be used for communication and only 3% of the control indicated this as a use for computers.

Four research questions were written to establish the effects of the computer-mediated telecommunications on the quality of written products and the attitudes of students toward writing. The independent variable was the telecommunications network audience. The dependent variables were the holistic scores, the word count, the Flesh-Kincaid grade level, the Gunning's Fog index, and the five attitude composites. The data collected through the pre- and postattitude questionnaires were analyzed using frequency distributions and analysis of covariance to determine if there were changes in students' response to the attitude composites. Data from the writing samples, collected before and after the treatment, were analyzed using an analysis of covariance to factor out initial

differences and determine if there was a statistically significant difference in the final writing sample.

Research question one asked if there would be a difference in the written products of the two groups as measured by the holistic score and the three readability indexes: word count, Flesh-Kincaid Index, and Gunning's Fog Index. An F statistic from the analysis of covariance (ANCOVA) was utilized to determine if a statistically significant difference existed.

The results revealed there were statistically significant differences in the means of the experimental and control group for the holistic score measure, the word count measure, and the Gunning's Fog Index. Difference in holistic scores for the posttest writing averaged 0.61 points higher for the experimental group with the telecommunications audience. The difference in average length of text between the two groups was 59.73 words with significantly longer texts being written by the experimental group than the control. The Gunning's Fog Index score was 1.54 points higher for the experimental group. This higher score represented a statistically significant higher grade level required to read the writing of the experimental group compared to the control.

Research question two asked if there would be a difference in the quality of writing of male or female

partners as measured by the holistic score on the post writing sample. An ANCOVA test was used to analyze this research question. The result revealed there were statistically significant differences in means between the males and females in the study. The mean for the males was 2.98 and for the females was 3.87. An F statistic from the analysis of covariance determined that this difference of 0.89 points was a statistically significant difference in the quality of writing of the males and females in the study with the females scoring higher than the males on the holistic score measure of writing quality.

Research question three was established to examine the change in students' response to the attitude questionnaire dependent on whether they were male or female. An ANCOVA test was used to analyze this research question. The result revealed there was not a statistically significant difference in the means of the composite attitude items of writing with a computer, writing with a partner, and writing to an audience of the males and females in the study.

The females scored higher in two of the three composites utilized to analyze this question. The attitude composite that measured attitude toward writing with a computer and toward writing to an audience was higher for the females in the study.

Research question four was written to examine the change in students' response to the attitude questionnaire dependent on whether they were in the experimental or control group. An ANCOVA test was used to analyze this research question. The result revealed there was not a statistically significant difference in the means of the composite attitude items of writing with a computer, writing with a partner, writing with a partner at the computer, or writing to an audience after the treatment. The one exception was the composite that measured attitude toward working with a partner which showed a significant difference in the two groups with the control group scoring a higher composite score on this attitude measure.

Discussion of the Study Results

This study attempted to create a functional writing environment that used process writing, word processing, collaborative groups, and for the experimental group, an audience that became a reader of the students' writing as a result of the telecommunication network. The computer-mediated telecommunications environment created in this study provided the students in the experimental group with an audience other than the teacher, who gave timely and nonjudgemental feedback to their writing. One of the assumptions of this study was that the combination of these

variables would create a writing environment that would permit the students to think of writing as communication and that prompt, individual response to a student's writing would be highly motivating for the students to produce better written products.

Research suggests that word processing will encourage collaborative writing (Dickinson, 1986; Diaute, 1986a), that the timely response of a reader who is not the teacher will strengthen the writer's view of writing as a form of communication (Graves, 1983; Riel, 1989), and that a collaborative classroom environment will encourage girls to utilize technology (Kurland & Pea, 1983; Whooley, 1986). Students writing collaboratively using a computer with an audience other than the teacher could create a writing environment that would encourage students to write longer and more acceptable texts as well as improve their attitude toward writing and computers. The intent of this experimental study was to examine how this type of social based writing environment affected the quality of the final written product and the attitude of students toward writing with the computer, writing with a partner, working with a partner, and writing for an audience.

Using subjects who were familiar with word processing, competent in using the computer, and experienced in working in cooperative learning groups, were essential elements in

this study in order to reduce the effect of confounding variables. The results of the demographic survey and teacher interviews suggests that the effect of some of these variables was minimized.

Discussion of the telecommunications network effects on scores of the experimental and control group

Question one asked if there would be a difference in the quality of writing of the experimental and control group after the treatment. Holistic scores, length, and readability analysis indexes were evaluated in order to determine the effect of the network audience on the written product.

As reported in chapter four, three measures of writing quality: holistic scores, average length, and the Gunning's Fog Index, were significantly higher for the experimental group who had the telecommunications audience than for the control group who wrote for the teacher audience. These significant results indicated that the treatment effected the quality of the written product. This finding supports previous research suggesting that an audience that was someone other than the regular classroom teacher and writing that was used to communicate to an audience, should

influence the quality of the writing (Riel, 1985; Bright, Hunsberger, & Labercane, 1988; Newman, 1989). This finding also contributes to the research suggesting that the computer-mediated telecommunications network environment helps students understand writing for a purpose and to communicate to a real audience (Diaute, 1988; Riel, 1985; Graves, 1985). Thus, the results suggest that a telecommunications network used to create a writing environment with a distant audience will make a positive difference on the written communication skills of young writers.

Overall, the holistic score, the word count, and the Gunning's Fog Index measures support the use of a telecommunications network to create a writing environment in the classroom. The students in the experimental group did significantly better on these three measures used to determine the effect of this environment on the written text.

Discussion of the functional writing environment on the writing scores of males and females

Question two asked if there would be a difference in the quality of writing produced by males and females in the study. Since all writing was done in pairs who were of the same sex, the study examined how this collaborative

arrangement based on gender may have affected the written quality of the texts.

The results of the data analysis of the holistic scores on the written products show that the girls wrote significantly better than the boys on the post writing samples. Although this might have been expected in normal writing assignments for fifth grade girls, earlier research indicated female students generally had less involvement and interest in computers and related activities than males (Cole, Griffen, & LCHC, 1987). Lack of involvement or interest of the girls did not seem to be a factor in this study.

The results of this analysis of data indicated a functional writing environment that includes cooperative learning and equal access to computers created a learning environment which equalized any advantage boys may have with technology. When computers were used as a writing tool, it encouraged the development of writing at the computer and an acceptance of technology by the girls.

The addition of the telecommunication network in the experimental group which introduced new technology into the classroom did not alter the results. The girls in the experimental group also scored higher than the boys in this group. In the experimental group the girls were well aware of using the computer to access the distance audience using

the telecommunications network. This was indicated by their response to the postquestionnaire that measured knowledge of the use of computers to send messages. In fact, the results of the questionnaire indicated that 55.6% of the girls and 50.0% of the boys were aware of using computers for telecommunications.

As technology has been introduced into the schools there has been a concern from some educators about the equity of the use of computers and other technology in the classroom for both females and less assertive students. Reports indicated that a few students, usually males, may dominate the computer and that females did not always utilize the technology that was available in the classroom (Center for Social Organization of Schools, 1983-84; Cole, Griffen, & LCHC, 1987). The research on cooperative learning suggests that the way students are grouped in the classroom can alleviate some of the anxiety toward technology and encourage cooperation and use of the technology (Hawkins, 1985; Hawkins & Sheingold, 1986).

This research study was conducted in a setting where both the girls and the boys had an equal chance to utilize the computers. The pairing of students for the collaborative writing assignments created a cooperative environment that should have encouraged peer interaction and feedback. This type of classroom environment, in both the

experimental and control groups, does seem to have created a learning situation which equalized the variables concerning equal access to computers and alleviated some computer anxiety for both the males and females as well as encouraged peer collaboration.

Another finding from this study was the boys in the experimental group improved significantly in the holistic scoring of the writing compared to the boys in the control. The addition of the distance audience with individual reader response to the student's writing and a more purposeful writing activity may have contributed to the increase in the writing scores of the males. The literature suggests that having a purpose for writing and writing to an audience other than the teacher will affect the quality of the writing produced (Graves, 1985; Riel, 1985; Bright, Hunsberger, & Labercane, 1988; Newman, 1989). Graves (1983) notes that children write more effectively when they are writing for a purpose and when they know someone other than the teacher will be reading what they write. The findings of this study also indicates that boys may be motivated to write for a defined purpose and to the nonteacher audience.

The boys in the experimental group expressed more interest in learning to use the telecommunications to send the written material and read the mail from the distance audience. The teachers allowed them to pursue this interest

and learn to use the computer to check for correspondence. Creation of an environment that encourages writing as a form of communication and for a clear purpose seems to be a strong motivation for young boys to write longer texts and texts that are judged superior to writing of boys that do not have this contextual writing environment.

Discussion of the telecommunication network effects on attitude of the males and females

Question three asked if there would be a difference in the males' and females' attitude toward three of the composites measured: writing with a computer, writing with a partner at the computer, and writing to an audience.

An attitude questionnaire was designed to determine if there were changes in students' response to the survey dependent on the gender of the student. Even though the statistical analysis did not reveal any statistically significant difference in the male and female's attitude on the composite items of writing with a computer, writing with a partner at the computer, and writing to an audience, there were some interesting results.

The students in both male and female groups had very high attitude composite scores on writing with computers. There was no significant difference in this composite, however; the attitude composite of the females toward

writing with a computer and toward writing to an audience was higher than the males. This indicates that young girls who were in a technology rich environment have as positive an attitude as the boys, and in this study their attitude composite score was more positive.

The attitude of both boys and girls toward writing with a partner at the computer ranged from not sure to disagree on the Likert scale. This is evidence of a very negative response to this attitude composite which indicates that the students had a negative attitude toward using the computer to write with another student before and after the experimental study. This may have resulted from the fact that each student in this study had a computer assigned to them. The lack of a positive attitude toward sharing the computer for writing may have been a reaction to the newly acquired computer and the novelty of having their own computer. Another interpretation of this attitude is that the students were not experienced in collaborative writing. Even though the students had worked together in cooperative learning groups, the skills needed to write collaboratively with a partner may be different than those required in other cooperative group work. The practice of writing in cooperative groups should be established before writing together at the computer.

Discussion of the telecommunication network effects on the attitude of the experimental and control group.

Research question four asked if there would be a difference in the students' attitudes if they were in the experimental or control group.

The attitude composite that measured attitude toward writing with a computer was positive for both groups and changed very little as a result of the experiment. This may reflect the familiarity of the subjects in this study with using the computer to write. Writing with the computer was not a novel experience and may have been considered a routine classroom activity.

The results of the attitude composites that measured cooperative attitudes: writing with a partner at the computer, writing with a partner, and working with a partner, all seemed to reflect ambivalence and uncertainty about this arrangement. The students in the study had worked cooperatively, but this did not seem to be considered a positive experience. This is reflected in the attitude that was noted in the exit interview. This finding is interesting and could be the result of the age of the students. This age student may respond to the cooperative arrangement but may still be reflecting the need to see themselves as separate individuals and in the developmental process of developing their own voice.

The attitude component that measured the attitude toward writing to an audience was very positive. There was no significant attitude difference in the two groups. If this composite score reflects normal fifth graders attitude toward writing to an audience, the creation of an environment that allows students to write to an audience other than the regular teacher who gives personal feedback to the writer should not be ignored (Graves, 1983; Cohen & Riel, 1989).

Discussion of Qualitative Findings

The results of the exit interviews with several students provided some interesting insights into the students' attitudes toward writing with a partner and writing to a reader over the telecommunications network. The expressed attitude toward writing with a partner was reflected in the measured attitude component. All of the students interviewed had reservations about writing with a partner. Although several of the students mentioned benefits such as getting more ideas and having someone to help, most said that they would like to write by themselves.

This attitude toward writing with a partner suggests that when students are paired for writing assignments there should be time at the planning and revising stage for collaborative work but for this age group, the students may

still be egocentric about their writing and want to express ownership of the ideas by writing individually at some point in the writing process. This attitude may also be a reflection of the emphasis that our schools place on individual achievement and that by the fifth grade many students understand this emphasis and resist cooperative group work.

The results of the question relating to the telecommunications exchange by the experimental group reflected a very positive response. The writing activity was taken out of the context of a class assignment and with the use of the outside audience the students had very positive comments about someone else reading their writing, not knowing what someone would say about their writing, and enjoying getting a response from someone else. The rapid response made possible by the telecommunications probably added to these positive feelings. The nonjudgemental and supportive comments made by the readers seemed to create a climate of positive interaction and may have contributed to the continued motivation of the experimental group to write.

Recommendations for Further Study

Results of this study indicated promising results but further research is needed to corroborate the findings. The following recommendations are made to guide these studies.

The first recommendation is to extend the length of the study to a school semester. The setting up and execution of this complex functional writing environment requires time for the teachers to become familiar with the equipment and gain expertise in transferring the information over the network. Time is also needed to incorporate the writing assignments into the established curriculum without the students or the teachers feeling as if the writing assignments are forced into their time schedule.

The second recommendation is to have fewer writings sent online. Instead of several writing assignments with one response to each assignment, the researcher suggests that there be at least two responses to the same assignment.

The third recommendation for further studies is to give the students a chance to modify their writing based on the comments that the readers make. In this way, the feedback from the distant audience would then become part of the revision process.

The fourth recommendation deals with the pairing of student for the cooperative writing assignment. An attempt should be made to balance the teacher's decision on pairing the students with the student's preference of a writing partner.

The fifth recommendation is more general and suggests that schools encourage and reinforce cooperative language

experiences. Writing should be taught as an interactive and social experience.

A sixth recommendation would be to carefully consider the number of writing assignments that students write together before there are changes in partners. Earlier research suggests that it takes time to learn to write with a partner, but the optimal length to work with one person is still in question.

The final recommendation is to change the time during the writing process that the writing is done collaboratively. The use of writing partners for the prewriting and again at the revision and editing stages of the writing process may be the most productive use of the collaborative arrangement with the writing partner. The point in the writing process that is best arranged as a collaborative experience and the age of the students that use collaborative writing are both areas that needs careful analysis and examination in order to make recommendations to educators.

Conclusion

A review of the related literature and research suggests that the combination of the computer, collaborative groups, and an ability to communicate with another person over a telecommunication network, may contribute to the increase in

writing skills in the young writer. However, there is very little empirical research that examines the complex writing environment formed as a result of the combination of these factors.

This empirical study investigated the effects of the functional writing environment on the writing quality of fifth grade students. The telecommunications network was used to establish a purposeful writing activity. Writing in this contextual environment allowed the students to experience writing as communication with a partner and with a reader outside the classroom that responds to their writing. The students in the experimental group wrote four writing assignments with a partner and received written response from a reader over the network. The focus of the study was on the potential of the computer-mediated communications to create a contextualized writing environment. The contextual environment resulted in the students realizing there was a purpose for their writing and an audience other than the classroom teacher who responded to the writing as a form of communication.

Results of this study supported the capability of a functional writing environment which includes the telecommunications network to create a classroom climate where students wrote to communicate with the online audience. The telecommunication created an environment

that encouraged students to write longer texts and texts that are judged superior than students who wrote only for their classroom teacher. There is also evidence females who are exposed to a computer intensive environment where attention has been paid to creating a supportive atmosphere with equal access to the technology have a positive attitude toward computers and understand and accept additional technology that is introduced into the environment.

Collaborative writing assignments that require students to plan, write, and rewrite with a partner seem to be less desirable for students who have immediate access to a computer and have established a routine of writing alone at the computer. The collaborative activity may have had more positive results if it had been used at the planning and rewriting stage of the writing process. These activities may have elicited a more positive attitude if the writing environment encouraged social interaction and collaborative writing. If this cooperative environment was the norm for the classroom then cooperative writing with a partner would have been similar to other cooperative activities that the students had experienced in the classroom and would have been more easily accepted.

Both Vygotsky and Piaget emphasize the importance of environment in learning language where children can interact, explore, and communicate ideas. The computer and

telecommunications can enrich the classroom writing environment to enhance the process of writing as a cognitive and social interactive process. As theorists continue to search for explanations of how children learn to write and researchers test these theories, perhaps the best indication of the importance of a functional writing environment is that the students sustained an interest in writing and enjoyed writing to the audience on the network. It is hoped that this study will be followed by others that will explore the possibilities of network connections and environmental arrangements in encouraging young writers to develop their writing potential in a social environment that encourages collaboration with each other and interaction with audiences outside the classroom.

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APPENDIX A: COVER FORM FOR QUESTIONNAIRE COMMENTS

The target audience for this questionnaire is a fifth grade student who has some knowledge of computers and process writing. The purposes of the questionnaire are to:

- (1) collect background information regarding each child's exposure to computers.**
- (2) collect information regarding each child's attitude toward writing with the computer.**
- (3) collect information regarding each child's attitude toward writing with pen and paper.**
- (4) collect information regarding each child's attitude toward writing alone.**
- (5) collect information regarding each child's attitude toward writing with a partner.**
- (6) collect information regarding each child's attitude toward writing alone at the computer.**
- (7) collect information regarding each child's attitude toward writing with a partner at the computer.**
- (8) collect information regarding each child's attitude toward writing for an unseen audience.**
- (9) collect information regarding each child's attitude toward writing for a classroom audience.**

Could you please review the questionnaire and comment on:

- (1) the appropriateness of the questions for fifth graders.**
- (2) the wording of any question that might pose comprehension problems**
- (3) any other suggestions for improving the questionnaire.**

APPENDIX B: BACKGROUND AND ATTITUDE QUESTIONNAIRE

QUESTIONNAIRE

Please check the appropriate response.

BACKGROUND INFORMATION:

1. ☐ Female ☐ Male

Questions 2 through 8 are about using computers.

2. Does your family have a computer at home? ☐ Yes ☐ No (If no, go to question #9)
3. Do you use the computer at home? ☐ Yes ☐ No (If no, go to question #8)
4. How often do you usually use the computer at home?
☐ more than once a day
☐ once a day
☐ twice a week
☐ once a week
☐ every two weeks
☐ once a month
☐ less than once a month
5. What reasons do you use the computer at home? (Check all that apply)
☐ to write papers, letters, or stories
☐ to program (LOGO, BASIC)
☐ to practice keyboarding
☐ to do homework
☐ to communicate with someone in another place
☐ to play games
☐ other: (please explain) _____
6. When you are working on the computer at home, how long do you usually work?
☐ less than 15 minutes
☐ 15 minutes to 1 hour
☐ more than 1 hour
7. When you have a question or problem about the computer that you can't solve, who helps you at home? (Check all that apply, then go to question #9)
☐ mother ☐ father ☐ other (please explain) _____
☐ brother ☐ sister
☐ friend ☐ there is no one to help me at home
8. If you don't use the computer at home, why don't you? (Check all that apply)
☐ don't like to use it
☐ don't know how to use it
☐ don't have time to use
☐ not allowed to use it
☐ other: (Please explain) _____

Questions 9 through 13 refer to using the computer at school.

9. Have you used a computer at school? ____ Yes ____ No (If no, go to question #16)
10. How often do you usually use the computer at school?
____ more than once a day
____ once a day
____ twice a week
____ once a week
____ every two weeks
____ once a month
____ less than once a month
11. How do you use the computer in school? (Check all that apply)
____ to write papers, letters, or stories
____ to program (LOGO, BASIC)
____ to practice keyboarding
____ to practice math
____ to practice spelling
____ to communicate with someone in another place
____ other: (Please explain) _____
12. When you are working on the computer at school, about how long do you usually work?
____ less than 15 minutes
____ more than 15 minutes
____ more than 1 hour
13. If you need help while working on the computer at school, what do you do? (Check all that apply)
____ ask the teacher
____ ask the librarian
____ ask another student
____ look in a book
____ just keep trying until I work it out
____ go do something else
____ other: (Please explain) _____
14. Which of the following can you do? (Check all that apply)
____ put a disk into the disk drive
____ use the keyboard
____ use a word processor to write
____ draw pictures
____ write computer programs (LOGO, BASIC)
____ other: (please explain) _____
15. How did you learn about computers? (Check all that apply)
____ teachers in school
____ friends
____ family members
____ books
____ taught myself
____ other: (Please explain) _____

ATTITUDES:

The following statements have to do with how you feel about using computers, writing and working with a partner. Read each statement carefully then circle 1 if you strongly disagree with the statement, circle 2 if you disagree, circle 3 if you aren't sure how you feel, circle 4 if you agree with the statement, and circle 5 if you strongly agree.

	1=strongly disagree	2=disagree	3=not sure	4=agree	5=strongly agree
16. Writing is too difficult to do with a partner.	1	2	3	4	5
17. I like to read my writing to a friend.	1	2	3	4	5
18. I prefer to write my final copy using paper and pencil.	1	2	3	4	5
19. It's more fun to write with a computer than paper and pencil.	1	2	3	4	5
20. I like writing alone at the computer because I can make my own decisions.	1	2	3	4	5
21. I prefer to work alone when I am writing at the computer.	1	2	3	4	5
22. I like to write in my diary or journal.	1	2	3	4	5
23. Using the computer makes it easy to correct my writing.	1	2	3	4	5
24. I prefer to write my first draft with paper and pencil.	1	2	3	4	5
25. It is easy to change periods and commas in my writing when I use pencil and paper.	1	2	3	4	5
26. I like to write using the computer.	1	2	3	4	5
27. When I am writing on the computer, it is easy to go back and erase mistakes.	1	2	3	4	5
28. I will always write on the computer when I can.	1	2	3	4	5
29. I like to correct my writing when I write with paper and pencil.	1	2	3	4	5
30. I prefer to write down my first ideas on paper.	1	2	3	4	5
31. I have the most fun writing when I write using the computer.	1	2	3	4	5

	1=strongly disagree	2=disagree	3=not sure	4=agree	5=strongly agree
32. I find it difficult to change ideas in my writing when I am using a computer.	1	2	3	4	5
33. I like having someone to work with when writing.	1	2	3	4	5
34. Writing many different ideas is easiest with pencil and paper.	1	2	3	4	5
35. When I work with others I usually do most of the work.	1	2	3	4	5
36. I like to have other people tell me if they like my writing.	1	2	3	4	5
37. I like to write to friends.	1	2	3	4	5
38. When I work with a partner, I get more done.	1	2	3	4	5
39. I like to talk to a friend when I have a problem to solve.	1	2	3	4	5
40. I like to know who I am writing to.	1	2	3	4	5
41. I like to do my homework alone.	1	2	3	4	5
42. I write best at the computer when I have a partner.	1	2	3	4	5
43. I like to write notes to my friends at school.	1	2	3	4	5
44. Most of the time I would rather work at the computer with a partner.	1	2	3	4	5
45. I like to study with a friend.	1	2	3	4	5
46. I like to write to a penpal .	1	2	3	4	5
47. I like to work alone at the computer as much as possible.	1	2	3	4	5
48. It is easy to go back and change my spelling when I write with pen and paper.	1	2	3	4	5
49. I would like to write to a friend who lives far away.	1	2	3	4	5
50. I like to do my classwork alone.	1	2	3	4	5

APPENDIX C: HOLISTIC SCORING RUBRIC

Holistic Scoring Rubric

Instructions for using the scoring guide: (1) Read the paper quickly to get a general impression. (2) In evaluating, keep in mind the characteristics described below. (3) Assign the score which reflects the overall quality of each paper.

Possible Scores:

6 [Excellent example - All] Papers scored 6 will address the writing prompt and will be well organized. Ideas are clear and understandable. They will be fluent and with enough length to develop all the ideas and points. There may be a few mechanical errors, but generally there will be complete sentences, correct punctuation, and correct spelling.

5 [Good-Most] Papers scored 5 will address the writing prompt and will be well organized. They will be fluent but may be less developed or detailed than 6 papers but they will still show good language control. These papers will exhibit more mechanical problems but not so much as to interfere with the meaning.

4 [Adequate-Many] These papers will be adequate and address the parts of the writing prompt, but organization will be less discernible than 6 or 5 papers. They will be fluent, but lack the development and will not include the number of details as 6 or 5. Mechanical problems are frequent but generally exhibit complete sentences and correct punctuation.

3 [Marginal-Some] This score is appropriate for papers which ignore one or more parts of the assignment. For example, they may not explain "why." Organization is random and ideas may be vague and underdeveloped with few supporting details. These papers will be too brief, too general and have many mechanical errors.

2 [Poor-Fair] This score will reflect a serious lack of organization and incomplete address of the prompt. Very thin content and may have serious errors in mechanics causing confusion.

1 [Very Poor-None] These papers will have very little or no evidence of addressing the prompt. Errors are so numerous and serious that they interfere with communication.

APPENDIX D: EQUIPMENT USED IN STUDY

List of Equipment used in study

Blue Earth Elementary:

Ninety (90) Apple IIGs' Computers

Printers

Modem

Macintosh Computer (1)

Telephone line

America Online Software

Iowa State:

IBM 486 Computer

2400 Baud Modem

Telephone line

America Online Software

APPENDIX E: SAMPLE ONLINE CONFERENCE

Transcript of the online real-time conference between the teachers at Blue Earth and the researcher.

BEGrade5A Good morning, Gayle from BE Grade 5

OnlineHost You are now in room "Lobby A."

GayleISU Hello BE

GayleISU I think we are connected

BEGrade5A Sara, Janet, and Frankie are here today.

GayleISU Great. How are things going?

BEGrade5A Dan is busily doing report cards.

BEGrade5A Things are going fine. Nice to have a workday to do our report cards.

GayleISU I'm really pleased that this is going so well. I know you are ready to finish this project.

GayleISU Are we all together on the 4th assignment?

GayleISU When do you want to write the Posttest?

BEGrade5A David will hopefully post our 4th writing assignment today.

GayleISU I will try to get the ISU students to respond Mon/Tue.

BEGrade5A We will do the post test on Wednesday, the 18th.

GayleISU Will you want more than one day? or is that enough?

BEGrade5A We will use 2 days again as we have been doing with the writings each week.

GayleISU That sounds great. It will still be the one we discussed on the description of the town.

BEGrade5A That sounds good to us.

GayleISU I will try to come up on Wed and bring the final questionnaire

GayleISU by the way, my students really like seeing the photos !

BEGrade5A That sounds fine. Our students really have enjoyed seeing the persons who have been reading their wri

GayleISU Did you find the responses that I sent in the attached file?

BEGrade5A writing. We have them on our bulletin board.

David did some video taping yesterday.

GayleISU That will be fun to see. I'll have to show it to my class

BEGrade5A We haven't read our mail yet today.

GayleISU Well, I'm sure you have a million things to do.

So I think I have most everything said.

GayleISU Is there anything else we need to discuss?

BEGrade5A We will see you on Wednesday. Have a safe trip.

We'll work on lunch since this may be your last trip.

GayleISU Great and Thanks

BEGrade5A Good bye from Blue Earth, MINNESOTA

GayleISU Bye from ISU, Ames, Ia.

APPENDIX F: WRITING ASSIGNMENTS

All times suggested on the writing assignments are flexible. The teachers agreed on the total time for each assignment and the approximate time suggested for different parts of the writing process but there was no attempt to limit each segment to the listed time.

Pretest Writing Assignment:

Today we will write a description of Our School. But before we do let's talk about school. There are many different schools in big cities and small communities. What would a school in a big city look like. How would it be like ours? How would it be different? If someone were visiting our school, what would you want to show them?

Brainstorm ideas as a whole group. After several ideas have been discussed, how each writing pair decide together some things they would like to show a visitor to their school. After they have discussed and decided what they would like to show someone, have them think about why they chose the things they did. For example, if they chose the gym and the playground it might mean that they thought sports was important. If they chose the library, it might mean that they liked books.

Together with your partner write a description of our school. Why did you choose to describe it in the way you did? What does your description of the school say about what you like and think is important? Please write a first draft, then revise and correct and save your final copy to your disk.

Writing Assignment One: Inventions

Today we will write about inventions. Inventions are things that people have made like t.v's, locks, and books. All of us use inventions everyday. There are many things that people have invented that we used today. Some inventions we use are very complicated like cars and buses, some are simple like the knob on the door. Let's think of some inventions that we use everyday. What do these inventions do to help?

Allow time for class discussion and brainstorming for ideas about inventions. List these on the board.

As we can tell from our list, inventions are things that people have made to help make our live easier and more fun. Now I want you and your partner to think of a new invention that you could make. Describe what your new invention will do and how it will look. Explain how you think it will help people or be fun to use. After you have written, remember to revise your writing and correct mistakes and save your final copy to your disk.

Writing Assignment Two: Games that people play in Blue Earth

Games are activities that some people do for fun. Games can be mental or physical. Some physical games are basketball and ice skating. Can you think of others?

Discuss

Other games are mental games like monopoly and chutes and ladders. What other mental games can you think of?

Discuss

Are some games mental and physical?

Discuss

What kind of games do you like to play? What are other games that you have seen people in Blue Earth play?

Discuss and list on blackboard.

If you could choose two games for a new friend to play with you, what games would you choose? Describe how you play these games and write about why you like to play them and why your new friend might like them. After writing, revise and correct your work. Save your final copy to disk.

Writing Assignment Three: Time Capsule

A time capsule is a sealed container which contains items that people think are important and represent something they think should be remembered about the time they lived. These containers are usually buried for a certain number of years. Today we are going to write about a pretend time capsule that we are going to fill with selected items that will be opened by a fifth grade class here in 25 years. Let's talk about some of the things we can choose to place in our time capsule.

First we need to decide how big the capsule will. Remember we have to carry it and bury it.

(Class discussion about 10 minutes)

Now we need to think of some things we want to put in the capsule. We need to consider things that would fit in the space and would be durable. We also should think about what the items we choose will say about us and what we like and think important.

(Brainstorm and list - about 10 minutes).

After class discussion, the writing partners should begin to work together and decide on what they want to place in their capsule.

Now that you have talked about what you want to put in your capsule, I want you to describe the items you have chosen. Why did you choose these items? What do the choices that you made say about what is important to you and what you want people to remember?

Writing assignment four

Prewriting (about 5-10 minutes)

How many of you like to enter contests? How many of you like to win contests? Well, today we are going to pretend that we are in the final round of winners in a "Travel Adventures" contest. What we have to do to be eligible for the grand prize is to write about a travel adventure we would like to take. The travel adventure you describe can cost as much as \$10,000.00 and you can go anywhere in the world and do anything that you and your partner choose. Before you begin to write with your partner, I want the two of you to think about where you would like to go if you could go anywhere in the world and have any adventure you want. Think about this for a few minutes. Let your imagination run free. As you think of places you would like to go and think you would like to do, make a list and we will share these ideas in a few minutes.

Sharing (about 5-10 minutes) The students should share part of their list with the class. As they hear new ideas, they may want to add to their list. Then have some of them share why they chose this travel adventure and tell what they want to do on the trip.

Writing (about 30 minutes).

Now of course we can't go to all those places and do all those things so you and your partner will have to agree on one travel adventure to write about for the contest. These are the rules and the questions that you and your partner will have to answer for the contest. First, you both have to go together, so you have to decide where you will want to go. You will have to give your reasons for wanting to go to this place and have this adventure. In other words, why should you win the contest? Then you will have to decide if you want take other people with you. Finally, you will need to write about the things you would need to take on the trip with you. After discussing these things and deciding, begin to write about your ideas. Make sure both partners get to add their ideas and thoughts to the paper.

Revising (about 15 minutes) After writing your paper, revise and make any corrections and changes needed.

The posttest writing assignment:

Prewriting. (about 10-15 minutes)

There are many different towns in our country. Some of them are very small and some very large. But each town has things that make it unique and special to the people who live there. If someone were visiting our town, what would you want to show them? What special events or activities would you like them to attend? What special holidays do you observe? What are some sporting activities that are popular?

Discuss and list (about 5 minutes)

Writing - (about 30 minutes)

After several minutes of discussion, have the writing team decide what they would like to show a visitor to the town and why they think it is important for them to see and know about what they chose.

Assignment:

Write a description of our town. Think about the things that you want to show a visitor. What does this say about what you think is important and what you like about our town.

Revision (about 15 minutes)

Final Copy (about 5 minutes)

APPENDIX G: HUMAN SUBJECTS FORM

9. **Confidentiality of Data:** Describe below the methods to be used to ensure the confidentiality of data obtained. (See instructions, item 9.)

All materials collected from the students will be coded for identification purposes only. The printouts will be identified by student ID numbers only and will be destroyed after analysis of the data.

10. **What risks or discomfort will be part of the study? Will subjects in the research be placed at risk or incur discomfort? Describe any risks to the subjects and precautions that will be taken to minimize them. (The concept of risk goes beyond physical risk and includes risks to subjects' dignity and self-respect as well as psychological or emotional risk. See instructions, item 10.)**

There are no risks or discomforts that will be incurred as a part of this study.

11. **CHECK ALL of the following that apply to your research:**

- ☐ A. Medical clearance necessary before subjects can participate
- ☐ B. Samples (Blood, tissue, etc.) from subjects
- ☐ C. Administration of substances (foods, drugs, etc.) to subjects
- ☐ D. Physical exercise or conditioning for subjects
- ☐ E. Deception of subjects
- ☒ F. Subjects under 14 years of age and/or ☐ Subjects 14 - 17 years of age
- ☐ G. Subjects in institutions (nursing homes, prisons, etc.)
- ☒ H. Research must be approved by another institution or agency (Attach letters of approval) (Pending)

Approval has been acquired from the Blue Earth School District, Blue Earth, MN.

If you checked any of the items in 11, please complete the following in the space below (include any attachments):

Items A - D Describe the procedures and note the safety precautions being taken.

Item E Describe how subjects will be deceived; justify the deception; indicate the debriefing procedure, including the timing and information to be presented to subjects.

Item F For subjects under the age of 14, indicate how informed consent from parents or legally authorized representatives as well as from subjects will be obtained.

Items G & H Specify the agency or institution that must approve the project. If subjects in any outside agency or institution are involved, approval must be obtained prior to beginning the research, and the letter of approval should be filed.

Item E The informed consent from parents or legal guardians of the subjects will be obtained from a letter sent to the student's parents or guardian by the classroom teacher.

APPENDIX H: LETTER TO PARENTS

Dear Parents or Guardians:

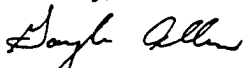
As a graduate student in Curriculum and Instructional Technology Education at Iowa State University, I am interested in studying how students utilize a collaborative networked environment for writing in the classroom as well as their attitudes toward the computer and writing with a partner. Results from this study should help teachers who use computers to teach writing understand how to meet the needs of students who use computers for writing and communicating.

The study is scheduled to begin September 22 and be completed by November 25, 1992. For this study, students will be asked to complete a questionnaire both before and after the study. Completion of the questionnaire should take approximately 15 minutes. The questionnaire will include items measuring demographic information, attitudes toward writing with a partner, and attitudes about writing with computers. The questionnaire will not ask for any names. Students will only be identified by an ID number for data analysis, and the questionnaires will be destroyed as soon as the study is completed. Students will also participate in writing with a partner at the computer. These writing activities will be apart of the normal writing assignments in the fifth grade curriculum. Two of the classrooms will be chosen to send their writing to penpals at another school which is also using a computer connected to a modem. The other two classrooms will share their writing with each other and their teacher. Students will print out a copy of their completed work to be collected by the researcher. The written work will be identified by student ID numbers only and will be analyzed to determine if there is an effect of the type of writing environment on the writing produced.

Although all students will complete the questionnaire and participate in the writing activities as a part of their normal classroom assignments, you may request, at any time, that the information collected from your child not be included in the analysis of the data. Should you have any questions, please do not hesitate to contact me (515) 294-8814 or Dr. Ann Thompson (515) 294-5287.

Please complete and sign the bottom portion of this letter and return it to your child's teacher by Friday, September 18. Thank you for your cooperation.

Sincerely,



Gayle Allen
Principal Researcher

Approved by:

Dr. Ann Thompson
Major Professor

Please circle your response, fill in your child's name, and sign and date the permission slip.

You may / may not use the information collected from by child, _____
in the data analysis of this research study.

Signature

Date